THE WORLD'S COTTON CROPS

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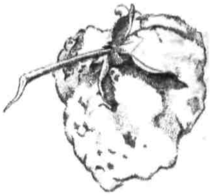

WITH
THIRTY-TWO PAGE ILLUSTRATIONS,
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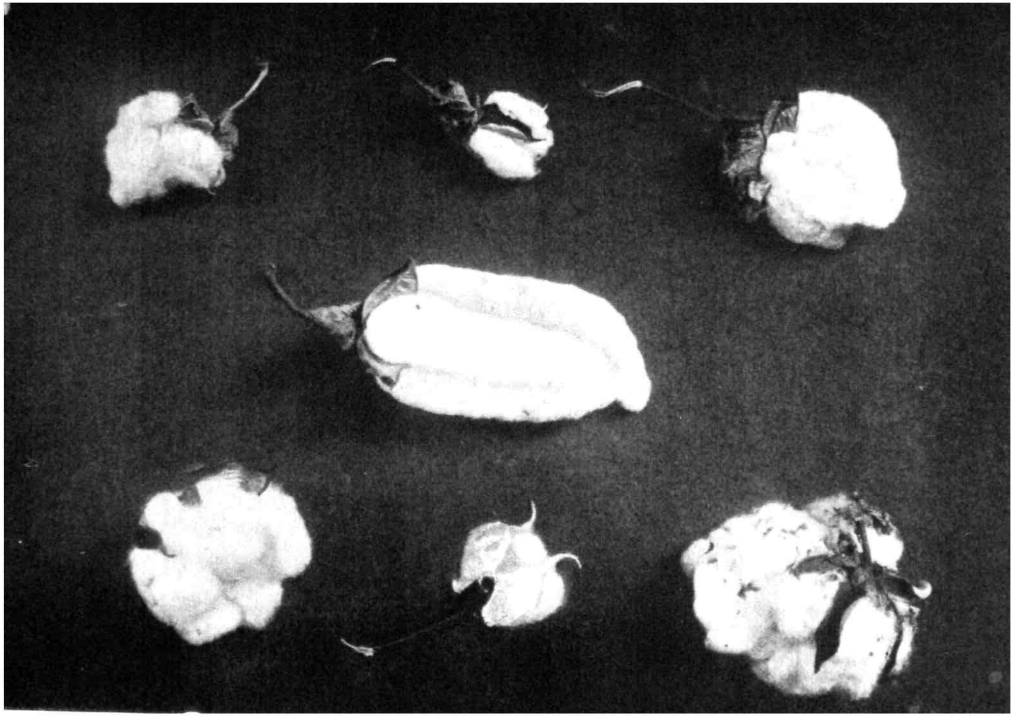
4, 5 & 6 SOHO SQUARE, LONDON, W.
1915



VARIOUS TYPES OF COTTON.

1–3. EGYPTIAN. 4. A PECULIAR TYPE OF INDIAN. 5. AMERICAN UPLAND. 6. SEA ISLAND.
7. LONG STAPLE AMERICAN.

PREFACE

THE chief objects of a preface should be to explain the aim or purpose of the book, to prove the need for its publication, and to indicate the writer's qualifications to deal with the subject.

The first of these should in this case be self-evident from the title. The aim of the book is to give, as briefly and comprehensively as possible, an account of the sources of supply of raw cotton, in a form sufficiently non-technical to be understood alike by the average grower and consumer, so that the former may learn something of the final destination and use of his crop, and at the same time may know what rivals he has in other countries; while the latter may understand the conditions under which his raw material is produced, and be able to estimate the prospects of the future supply from existing fields, or the possibilities of new sources of supply

The production of such a book at the present juncture is justified by the really critical position in which the cotton trade now stands as regards its raw material, and by the great amount of pioneer and development work which has been done in connection with cotton growing throughout the world during the present century. Information as to all this is only to be found in a large number of scattered and not easily accessible reports.

The writer's excuse for the attempt to supply the need

is simply that no one else better qualified seems to have had time to do it. His own qualifications are only those of an interested outsider. Born and brought up in the chief centre of, and in close touch with, the West of Scotland cotton industry, he spent five years in Egypt (1907-1912) during the highly critical and controversial time through which the Egyptian crop was then passing, and had his share in these controversies, for in Egypt economics and cotton are almost synonymous. Through this he was brought into touch with those interested in cotton in many countries, and with most of the important bodies, such as the British Cotton Growing Association, and the International Federation of Master Cotton Spinners' and Manufacturers' Associations, which look after the interests of cotton producers and cotton users throughout the world. Finally, he had an opportunity, in 1913, of visiting practically the whole of the American Cotton Belt.

Being neither a botanist nor an agriculturist, his information on technical matters is necessarily second-hand, but he has made every endeavour to get it from the most reliable sources. In any attempt to deal with so huge a subject, errors are bound to have escaped notice, though every chapter has been revised and checked by first-hand authorities; and he will be grateful to anyone who will point out mistakes or supply further information on any point, especially statistical. Through the kindness of the publishers, it will be possible to give effect to such corrections at an early date.

To acknowledge all the assistance he has already received from experts of every kind and in almost every

part of the cotton world is simply impossible. Government officials and private individuals interested in cotton growing in China, India, Russia. Egypt and the Sudan, in Africa. East and West, and in America, North and South, have been unstinted in their kindness, and unfailing in their patience. One name must be specially mentioned, that of Mr. W. Lawrence Balls, formerly Botanist under the Khedivial Agricultural Society in Egypt, latterly in the Egyptian Government Department of Agriculture, and now of Cambridge, to whose inspiration and instruction the writer is very largely indebted for his interest in and knowledge of cotton growing. His debt to the officials of the British Cotton Growing Association and the International Cotton Federation is even greater than can be gauged by the number of references to their publications.

In place of detailed references throughout the text, a list of the publications, reports, etc., on which each chapter is founded is given at the end of the chapter. The writer has to acknowledge the very great kindness of the many authorities and private workers who have sent him these publications, and will be very glad to receive or to hear of others not included in the lists. His thanks are also due to many friends for their loan of or permission to use photographs relating to cotton growing everywhere.

The disproportionate space allotted to Egypt may be explained, or excused, on the ground that Egypt is the world's chief example of cotton growing under irrigation, and that in the writer's view irrigation is showing a tendency to become the ruling method of cotton growing. In Russia, India, Egypt, many parts of Africa, in Arizona

and California, and in Peru, the best results are being got by irrigation, which is now responsible for at least half the world's crops, other than the American. The importance of the lessons learned in Egypt to the rest of the cotton-growing world seems, therefore, to justify the full treatment of its history, especially in regard to irrigation and drainage.

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July 22, 1914.

P.S.—As will be seen from the date, the foregoing was written and the bulk of the book was in type before the outbreak of the war, which inevitably has affected, and will affect, the cotton trade in innumerable and still unforeseen ways. To deal with all the effects of the war, even so far as they have already shown themselves, would mean recasting the whole book, and events are happening so fast that it might still be almost as badly out of date before it was published, as it may be in its present form. It has therefore been thought better merely to add a chapter on the immediate effects of the war, so far as they have already shown themselves, and a few notes throughout the text. For the rest, the book must go forth, as it was originally conceived, as an attempt to describe the world's cotton-growing industry as it was "in the old days before the war."

J. A. T.

February, 1915.

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THE WORLD'S COTTON CROPS

CHAPTER I

INTRODUCTORY

Recent history of prices—Supply: the world's total crops—Demand: great increase of consumption—Cotton substitutes, new uses, and improved fabrics—The problem of increased supplies.

IN 1894 the price of American Middling* cotton was below 3d. per pound in Liverpool. In 1904, owing to Sully's corner, it touched 8·96d., but within the year it was again below 4d. Since then (till the outbreak of the present war) it has only once been below 5d., and that only for a few days. The quinquennial average prices for the last twenty-five years have been as follows:

	American.	Indian.	Egyptian.
1889-1890 to 1893-94	4·81	4·25	5·76
1894-1895 „ 1898-99	3·76	3·43	5·22
1899-1900 „ 1903-04	5·44	4·60	7·39
1904-1905 „ 1908-09	5·79	4·89	8·86
1909-1910 „ 1913-14	7·16	6·20	10·54

During the season 1913-14 the basis price touched 7·96d., and until the outbreak of the war it had only fallen

* American Middling is the "basis price" which controls the prices of all other grades of American Upland cotton, and also, more or less, of all other kinds of cotton.

below 7d. for a very short time, the season's average price being 7·26d. (see Appendix, F).

In this marked rise of the general level of prices, cotton is, of course, not different in kind from practically every other raw material of importance; but on referring to the published Index numbers of the Board of Trade quoted in Table F, I., it will be found that other commodities have not shown anything like so great a rise.

For an explanation of this phenomenon, one naturally turns first to a possible reduction of supply, but the figures of the world's cotton crops quickly dispose of any such idea. The total crops of cotton have, as will be seen from the Appendix, A, increased very considerably and on the whole steadily for many years back. The figures of 1913-14 were the largest on record, while the quinquennial average for 1909-1914 was 24,660,000 bales, as against 20,468,000 for the previous quinquennium, an increase of 20 per cent.

World's Crop Statistics.

Turning then to demand, probably the simplest test of the growth of the world's consumption will be found in the International Federation statistics of the world's spindles (see Table B, III., in the Appendix). Their estimates of the world's total spinning spindles show an increase from 120,176,000 on August 31, 1907, to 143,452,659 in 1913, or 20 per cent.; while, according to their actual returns, the world's average consumption per 1,000 spindles has increased during the same period from 148 bales per annum to 156. These figures must, of course, not be taken as proving an absolute increase of consumption of the dimensions

World's Consumption.

indicated; it is obviously impossible to consume more cotton than the world has produced; but they at least show that the demand has increased out of proportion to the supply. In deference, however, to the feelings of the general reader, the detailed consideration of the figures of production and consumption is relegated to the Statistical Appendix.

These figures of demand are in accordance with the general impression conveyed by even a slight knowledge of the recent development of the cotton trade. There is no doubt that the consumption of cotton has in recent years been increasing by leaps and bounds. Three main causes may be mentioned. In the first place the spread of civilization throughout the world, with the consequent demand for more and better clothing, has within recent years been proceeding at a highly accelerated pace. According to a statement attributed* to the U.S. Department of Agriculture, it is estimated that of the 1,500,000,000 of the world's population, one-half are still only partially clothed, while about 250,000,000 wear practically no clothes at all. Of the clothing actually worn, nine-tenths of the raw material is cotton. The potential demand of the world for cotton goods is therefore almost unlimited. Ample illustration of this may be found in the enormous expansion of the trade with India, especially in 1910-11, when the unprecedented American crop was taken up like a sponge by the apparently inexhaustible demand for Manchester goods in India. In recent years the normal demand from China, and from Egypt and the Levant

Civilization and Clothing.

* "Cotton," by C. W. Burkett and C. H. Poe. 1906.

generally, has been much curtailed by wars. What the total demand would have been had it not been so, it is difficult to estimate.

In the second place, it is well known in all trade circles that cotton has during the last five or ten years shown an extraordinary capacity for successful substitution for other raw materials. Table and bed "linen," shirts, handkerchiefs and collars, "flannels," tweeds, etc., made largely or entirely of cotton, especially in the Continental ready-made clothing trades; "silk" thread and fabrics of all kinds made of mercerized cotton—all these are only typical of the way in which cotton has been successfully used, not merely in imitation of other goods, but as a perfectly satisfactory substitute.

Cotton Substitutes.

Again, numberless and apparently endless new uses for cotton have been discovered in recent years, such as webbing for motor-car tyres, type-writer ribbons, yacht and aeroplane sails, etc.

New Uses.

But perhaps the most important factor in the expansion of the demand for cotton goods is the extraordinary improvement in the quality of goods which can now be made out of cotton. "Cotton" is no longer a term of contempt applied to cheap and obviously inferior goods, which can only be used for very inferior purposes. The fabrics which can now be produced from pure cotton are in their own way as fine and as beautiful as any other material. Fine white cotton goods, such as nainsooks, madapollams, etc.; fine cotton nets, laces, and curtains; beautifully finished coloured cotton fabrics, such as dress linings and dress

Fine Cotton Fabrics.

materials of excellent quality and appearance, can now be turned out at prices bringing them within the reach of a class of consumers to whom such goods were a few years ago utterly unattainable. The demand which has thus been tapped is again apparently inexhaustible, for it is a middle-class demand. The middle and artisan classes can now wear clothes made of fabrics which a generation ago none but the wealthiest could afford, and they have shown themselves very quick to appreciate the new luxuries. In nothing has the improved standard of living of the working classes been more strikingly shown during the opening years of the present century than in this matter of the quality of the clothes they wear.

Here, then, we have evidences of demand which are amply sufficient to account for the unprecedented consumption of cotton, and it is as certain as anything can be in economics that we have not by any means reached the limits of this expansion. The consumption of cotton in recent years has been limited only by the supply, and the future possibilities of increase in demand are practically immeasurable.

Demand still increasing.

These conditions, then, are of themselves sufficient to produce a situation of great interest, and which may well be described as critical. The high prices we have already seen have not proved sufficient to check the demand seriously or for long. What is to be the future price level? That depends chiefly on the supply. A greatly increased supply, if not too sudden, can almost beyond doubt be taken up readily. But if that in-

creased supply is delayed, what will be the effect on price?

It appears, therefore, that the main factor in the future of the cotton trade is that of supply. Demand at a reasonable price may be almost taken for granted. The way in which the 1911 American crop was taken up the moment the price dropped below 5d. may be recalled as ample proof of that. Hence the importance of a wide survey of the whole world's supplies, present and potential, of "King Cotton." What are the possibilities of extension of or increased yield from the existing cotton-growing areas? What results may we expect from all the pioneer work in the development of new cotton-growing areas throughout the world during the last ten years, and, still more important, how soon?

Problem of Supply.

REFERENCES.

Weekly and Annual Circulars of the Liverpool Cotton Association.

Half-Yearly Statistics of the International Cotton Federation:
- Consumption and Stocks of Cotton, August 31, annually, from 1905.
- Stocks of Cotton, March 31, annually from 1906.

"Cotton Production" and "Cotton Supply and Distribution," published annually by the U.S.A. Government Bureau of the Census.

Jones's "Annual Cotton Handbook," published by Comptelburo, Ltd., London.

"Cotton Facts," published annually by the Shepperson Publishing Company, New York.

For others see List of Statistical Authorities, p. 390.

CHAPTER II

THE COTTON PLANT

The genus and its species—Appearance of the plant—Leaf, flower, and boll variations—Lint and "linters"—Lint characters of different species—Climate and cultivation—Labour.

COTTON belongs to the order of the *Malvaceæ*, or mallows, its generic name being *Gossypium*. It is therefore related to the English hollyhock, which it remotely resembles.

Genus and Species.

Experts in systematic botany differ greatly as to the number of separate species which can be distinguished, but the following are generally recognized:

A. GROUP OF OLD-WORLD, OR "ASIATIC," COTTONS.

Gossypium herbaceum. This includes most of the Indian and Levant cottons, and the native types of Russian Turkestan and Persia.

Gossypium arboreum, or tree cotton. Although tree cottons are found in other sections also, this name is usually restricted to a type resembling the Asiatic, and includes the sacred tree cotton of India.

B. TWO GROUPS OF "NON-ASIATIC" COTTONS.

1. THE UPLAND GROUP.—*Gossypium hirsutum* is so called from the hairy character of the plant, on stem, leaves, and seed. The American Upland is the chief representative of the group, to which Cambodia cotton

also belongs. The group is possibly also Asiatic in origin, though its most important cultivation is now in the New World.

2. THE PERUVIAN GROUP.—*Gossypium barbadense, maritimum,* and *peruvianum.* This group includes the Sea Island, Egyptian, Peruvian, Caravonica, and other cottons. The exact origin of these forms, which include the best kinds of lint on the market, is uncertain. They might also be roughly distinguished as the "vine-leaf" cottons.

Appearance. In appearance and growing characteristics the plant varies greatly in different countries, but it may be described as generally a bushy plant, growing about 3 to 6 feet high, with more or less wide-spreading branches, especially on the lower portion of the stem, and tapering to a pointed top. When closely planted, the development of the branching is reduced, and the plant grows more like a raspberry-bush than a gooseberry.

Root System. The root system also differs greatly according to the nature of the soil and the water-supply. In Egypt, for example, the main tap-root has been shown to descend over 6 feet into the ground in search of water, and it is probable that it would do the same elsewhere if conditions allowed. While, therefore, cotton does grow well on shallow soils as in Barbados, it does much better in deep soils.

Leaves. The leaves are large, and more or less deeply divided into three or five lobes, the form differing greatly in the different species and varieties. Thus, Sea Island has very deeply cut lobes, while American Upland represents the opposite extreme, more

like an ivy-leaf, but covered with hair, which gives it a dull appearance. The Indian leaf is smaller, with lobes characteristically rounded in appearance.

Flower.

The flower also differs considerably in colour from one species to another. It resembles generally the flower of the hollyhock in shape, but is more tubular, and is surrounded by three large bracts, or outside leaves. The flower of the Sea Island and most Egyptian types is lemon or golden-yellow, with crimson spots at the base of the five petals inside, and a golden brush of stamens; but that of the ordinary American Upland is creamy, usually without any markings, and has buff-coloured stamens. The Indian flower is also yellow, but smaller than the Egyptian, and the spots are larger and darker. The flower of the sacred cotton-tree in India is red. In fading, if the atmosphere is humid, the flower turns pink, and finally almost red, before it withers. It only remains open for one day.

Boll.

The boll, or fruit, before maturity is of varying shades of green, and differs very greatly in size—from ¾ inch to 1½ inches in diameter—and in shape in the different varieties. Thus, the Sea Island and Egyptian bolls, especially the former, are narrow and pointed, while the typical American Upland is much rounder, and appears much shorter.

Seed.

The boll is divided into from three to five *loculi*, or compartments, each containing a "lock" of seven to nine seeds, to which the lint—the actual cotton itself—is attached. Here, again, is a marked difference, according to the species and variety. The Sea Island and Egyptian seeds are black or brown, and

the lint comes easily and completely away from the seed in the process of "ginning," or separating the lint from the seed, except for a small tuft of short fuzz at the point in certain varieties. They are therefore known as "black" or "clean" seeds. In the American Upland and Indian varieties, on the other hand, there are two kinds of hair, one—the actual cotton or "lint"—being of about an inch in length, and coming away easily from the seed in the gin. The other is a short fuzz, which adheres very closely to the seed, and is only partially removed, even by the subsequent process of "delinting." What is removed by this process is known as "linters," and forms an appreciable, though not valuable, addition to the American crop. These seeds are known as "white" or "fuzzy."

Lint.

The length, strength, fineness, and character of the lint are, from the spinner's point of view, the characteristic distinguishing marks of the different varieties. Sea Island, for example, often exceeds 2 inches in length; Indian, on the other hand, may be less than ⅝ inch; while the diameter of the fibre varies from 0·0007 to 0·0011 of an inch. The appearance of the lint in the open boll also varies immensely, from the typical Indian, in which, when ripe, the contents of the boll hang right out to the length of 2 or 3 inches, like a bunch of grapes, to that of the Sea Island, which cling closely into the lock in a peculiar curled condition, like raw silk.

Ginning Out-turn.

The seed generally forms about two-thirds of the gross weight of the seed cotton, and the lint one-third; but this proportion, or "ginning out-turn," is much lower in the case of many varieties, and even higher in others—from 25 to 50 per cent.

The climate most suitable to cotton growing may be described as subtropical. The period of growth of the plant from sowing to picking is about five to nine months, but in many cases the picking season is very long drawn out. It requires an ample water-supply, which may be derived either from natural rainfall or from irrigation. It is important to notice how rapidly the growth of cotton under irrigation has developed in modern times. Cotton was certainly at first a rain crop—*i.e.*, a "monsoon" crop—in India; but the quantity of cotton grown under irrigation in every part of the world is now very large. Indeed, it appears that the best growing conditions can only be secured under irrigation. In America, for example, the crop suffers very seriously in certain seasons, owing to damage by untimely rain, which stains or "tinges" the ripe cotton, and materially lowers its value, while on the other hand, where irrigation is not possible, the crop is liable to serious damage by drought during the growing period.

Climate.

Water.

Where the growing season is likely to be prematurely closed by severe frost, the amount of the crop is liable to severe fluctuations. In America, for instance, the date of the first killing frost in autumn is often the determining factor in the final yield of the crop. Frost, on the other hand, is the worst enemy of certain insect pests which prey upon the cotton, such as the boll weevil in America. Again, the extermination or reduction of such pests is often greatly assisted by summer droughts; for most of them seem to flourish best under moist, shady, and relatively cool conditions.

Frost.

Insect Pests.

The cotton crop is one which requires a considerable amount of intensive cultivation at certain periods.

Cultivation and Labour.

Thus, after sowing, it requires to be "chopped," or thinned out, and the ground carefully "cultivated" (hoed), to keep it clear of weeds, and also to prevent unnecessary evaporation of the moisture in the soil. There is usually a period before final harvesting, when the crop is "made," or "laid by," as it is called in America, and requires little attention until picking-time arrives. Picking itself requires an immense amount of labour, which, indeed, is in many cases the limiting factor in the extension of the crop. Thus, on the whole, cotton is essentially a cheap-labour crop, and the best results are obtained when hand labour can be used throughout, as in Egypt.

The methods of picking, ginning, baling, handling, and selling the crop vary so greatly in different countries that the description of these processes will be separately dealt with under each country.

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W. Lawrence Balls: "The Cotton Plant in Egypt." Macmillan, 1912.

W. Lawrence Balls: "Development of Raw Cotton." A. and C. Black. (*In the press.*)

Sir George Watt: "Wild and Cultivated Cotton Plants of the World." Longmans, 1907.

CHAPTER III

THE GEOGRAPHICAL DISTRIBUTION OF COTTON

Species and varieties of cotton—Sources of supply and different uses — Classification — Best Sea Islands — Floridas and Georgias—Egyptian—American—Indian.

FROM the side of supply as well as of demand, the world's cotton market has increased in complexity and specialization as greatly as it has in bulk and extent. The *Weekly Circular* of the Liverpool Cotton Association now quotes the prices of no less than forty-six different varieties of cotton, of which four are American, five Peruvian, six Brazilian, two West Indian, six Egyptian, two African, nineteen Indian, and two miscellaneous (Chinese and Levant).

Many Varieties.

All of these have their own peculiar qualities and special uses. Their values varied in July, 1914, from, say, 4d. per pound up to 40d., with the basis price of American Middling about 7d. Most of them are specially adapted for and are mainly employed in certain particular trades, and the users of one kind may know nothing whatever of most of the others. All of them, however, are more or less interdependent, both as to supply and demand. There is a good deal of overlapping in the supply of different varieties—areas which may, and do, grow one variety or another at different

times, according to varying conditions or the movement of prices. Thus, there are parts of the Carolinas and Georgia which could grow either Sea Island or short staple Upland. On the other hand, there are increasing possibilities of substitution of one variety for another in spinning, such as the substitution of American long staple for Egyptian cotton, described in Chapter XIII., or of the better grades of Egyptian for Sea Island.

Substitution in Supply and Demand.

It is no longer sufficient, therefore, for the cotton-grower or consumer to know simply his own particular branch of the trade. Every cotton grower ought to know what his cotton is used for and what other uses it might be found suitable for; what other markets it might find its way into, either as a competitor with or as a substitute for other varieties of cotton, or even for other textile materials altogether, such as silk, wool, or flax. Again, he ought to know what other varieties of cotton come into competition with his own in his own markets, and what are the prospects of supply of these competitors. On the other hand, the cotton user, whether spinner or manufacturer, ought to know what kind of cotton he is using, and what are the sources of supply of that particular cotton, who else is using that cotton, and for what purposes, so that he may estimate their demand as well as that of his own branch of the trade; and, finally, whether there is any other variety of cotton which he might employ on more profitable terms.

Need of Wide Knowledge.

For the sake of clearness, some system of classification of the different varieties of cotton into broad grades

must be attempted, though it must be understood that no such classification exists in practice in the trade, and that the limits of the different classes are by no means clear or exact. The writer has attempted to frame such a classification, taking the different classes of cotton according to their quality or spinning capabilities, as follows:

Broad Classification.

1. The best cotton of all is the true Sea Island, grown on the islands (hence the name) off Charleston, South Carolina, and also in the West Indies. The total quantity of these crops is very small, but their value is very high, on account of their marvellous spinning qualities. The best Sea Island can be spun as high as 300's,* or even more, which means that 150 miles of the yarn spun from such cotton weighs only one pound. The use of these fine yarns is, of course, confined to the very highest grades of fabrics and the finest sewing-cottons. They are largely employed in the Nottingham lace trade.

Best Sea Islands.

2. Next to these come certain grades of Sea Island grown in Georgia and Florida, which are of excellent quality, though not so superfine as the real "Islands." In this class, too, must now be included the best Egyptian grades, such as Abbassi, Sakel, and Jannovitch, which are second only to the finest Sea Islands in quality and spinning capabilities. They are also extra strong, which has given them certain special uses of their own where strength and fineness are essential.

Florida, Georgia, Sakel.

* The "count" or number of cotton yarn means the number of hanks of 840 yards length, which weigh one pound avoirdupois; hence the higher the count the finer the yarn.

Egyptian.

3. In the third grade may be placed the ordinary varieties of Egyptian cotton, Afifi, or Brown Egyptian, and Ashmuni, or Upper Egyptian cotton. In competition with these during recent years have been the best varieties of American long staple Upland cotton, which for many purposes have proved themselves as good as ordinary Brown Egyptian. Peruvian cotton comes very close to this class of cotton, and some of the best of the new African cottons.

American.

4. The great bulk of the world's cotton-supply, however, consists of the ordinary American Upland crop, which amounts to about 60 per cent. of the whole world's supply. This has, of course, no rival in the matter of quantity, but there are various smaller crops which are round about the same quality—*e.g.*, Brazilian, West African, Russian, Asia Minor, and in recent years some of the improved varieties of Indian cotton.

Indian.

5. The greater part of the Indian crop, however, is in a grade by itself, of very short staple, and inferior quality. It is little used in Lancashire, but is largely employed in the local mills in India, in Japan, and also in most of the continental spinning countries. Similar to the Indian crop in quality are certain of the native varieties of Russian cotton. Finally, the great unknown of the cotton trade, the Chinese crop, is probably, on the whole, of Indian quality.

These five grades are classified with more detail in the following table, which also indicates the average amount of each crop. Further particulars of each crop will be given in subsequent chapters. It must, of course, be remembered that some of the figures here given are the roughest of estimates.

CLASSIFICATION OF THE WORLD'S COTTONS.

Class.	Spinning Counts (Maximum).	Length of Staple.	Liverpool Prices (July 10, 1914).	Average Crop.	Average Bale Weight.	Approximate Equivalent in 500-lb. Bales.	Remarks.
I. *Best Sea Islands :*		Inches.	Pence.	Bales.	lbs.		
Carolina "Islands"	300's	2 & over	$12\frac{1}{2}$–18*	12,000	400	10,000	—
West Indian	300's	2 & over	13–$18\frac{1}{2}$†	5,500	400 net	5,000	Also 2,000 bales equal to Florida and Georgia, and 10,000 still lower grade.
II. *Florida and Georgia*, Sea Islands	100's twist	$1\frac{1}{2}$–$1\frac{3}{4}$	$11\frac{1}{2}$–$12\frac{1}{2}$	85,000	400	70,000	—
Egyptian, Sakel, Jannovitch, Abbassi, etc.	100's twist	$1\frac{1}{2}$–$1\frac{3}{4}$	10–$11\frac{1}{2}$	300,000	740 net	430,000	—
III. *Egyptian*, Afifi, etc.	70's twist	$1\frac{1}{4}$–$1\frac{1}{2}$	$8\frac{1}{2}$–$10\frac{3}{4}$	700,000	740 net	1,000,000	F.G.F. Brown, 9·10d.
Long staple American Upland	70's twist; 120's weft	$1\frac{1}{4}$	Up to $10\frac{1}{2}$	200,000	520 gross	200,000	Also, say, 300,000 bales of $1\frac{1}{4}$ to $1\frac{1}{2}$ inches.
Peruvian	60's	1–$1\frac{1}{2}$	7–10	250,000	250	125,000	Also some Egyptian and Sea Island.
IV. East African	50's	1–$1\frac{1}{4}$	$6\frac{1}{2}$–10	48,000	400–550	40,000	Also some Egyptian.
Brazilian	50's	$\frac{3}{4}$–$1\frac{1}{4}$	6–9	600,000	250	300,000	Some $1\frac{1}{2}$ inch staple.
American Upland ..	40's	1–$1\frac{1}{8}$	$5\frac{1}{4}$–$8\frac{1}{3}$	15,000,000	510 gross	15,000,000	Middling, 7·33d.
Russian	40's	$\frac{9}{10}$–$1\frac{1}{8}$	(5–$7\frac{1}{2}$)	1,000,000	500 (some 250)	1,000,000	Not quoted in Liverpool.
West African ..	40's	1–$1\frac{1}{8}$	$6\frac{3}{4}$–$7\frac{1}{2}$	20,000	400–550	20,000	—
Asia Minor	40's	$\frac{3}{4}$–$1\frac{1}{8}$	(5–$7\frac{1}{2}$)	120,000	440	100,000	Rarely quoted in Liverpool.
V. Indian	30's	$\frac{3}{8}$–1	$3\frac{3}{4}$–7	5,000,000	400 net	4,000,000	Best varieties not quoted in Liverpool—say 6d. to 7d.
Chinese	30's	$\frac{3}{8}$–1	$6\frac{1}{4}$	4,000,000	500	4,000,000	Rarely quoted in Liverpool; some good American.
Total				27,340,500		26,300,000	

CHAPTER IV

INDIA

Ancient cultivation in India—Modern decadence in yield and quality—Recent improvements—The British Cotton Growing Association and the International Federation—Different varieties and areas in India, Burma and Ceylon—Marketing, ginning, and baling—Insect pests—Statistics—General economic considerations—Government Agricultural Departments.

As far as history goes, there is every probability that India was the original home of the cotton plant, in the Eastern Hemisphere at least, for there are positive records of cotton in India as far back as 800 B.C. This, of course, is no proof that the cotton found in various parts of America by Columbus and the other Spanish and Portuguese discoverers had not been cultivated there from still earlier times, but it at least gives India historical priority; the other is tradition or surmise.

Early Records.

The fact that India has fallen so far behind the United States in the volume and quality of its cotton crop is no test of its potentialities as a cotton-producing country. There is little doubt that cotton and cotton fabrics equal to the finest the world has produced have been grown and made in India. Yarns as high as 300's are recorded, and the fine

Modern Deterioration.

muslins of Dacca are traditional; while the very name of "calico" is derived from Calicut, in the district of Malabar. It is all the more to be regretted, therefore, that India's present position in the world's cotton-supply should be such a bad second. It is satisfactory to know, however, that future prospects are more hopeful, for it is clear from all the information available that, given reasonable cultivation and the development of irrigation facilities, India could both increase the output and improve the quality of her cotton crop enormously.

Area and Yield.

The area under cotton in India is now nearly 25,000,000 acres, and the total crop over 5,000,000 bales* of 400 pounds each, or an average yield per acre of less than 100 pounds of lint, as compared with the average of nearly 200 pounds per acre in the United States, and 450 pounds in Egypt. It is now known that, under the best conditions, good cotton land will produce easily 1,100 or 1,200 pounds per acre. What a gulf between possibilities and actualities! It must be kept in view, however, that in many districts of India cotton is still grown as a mixed crop—*i.e.*, with something else in the same field—though this practice is diminishing.

Quality.

The quality of Indian cotton to-day is just as unsatisfactory. In staple it is largely under ½ inch in length, while its condition as regards admixture of dirt, leaf, and trash, which constitutes the grade of cotton, is very inferior.

The causes which have produced this most unsatisfac-

* The 1918 crop was estimated at 6,000,000 bales in commercial circles in India.

tory state of affairs are just those which we know to expect in Oriental countries, if the native cultivators are entirely unsupervised in the application of their old-fashioned, short-sighted methods.

Causes.

Lack of seed selection, except of a negative kind, such as selling the best seed for crushing and keeping the rubbish for sowing, careless methods of soil cultivation, and bad handling of the lint and seed in picking and afterwards, have degraded Indian cotton to the lowest position in the cotton-growing world. Even in the cotton famine of the sixties, when the American Civil War compelled Lancashire to use anything that could be described as cotton, Surat cotton was spoken of as the most execrable raw material ever spun there, and the deterioration seems to have been going on even up till recent years. The reversal of these unfortunate conditions is, of course, a matter of time and patience, but the work has been well taken in hand in recent years by the Indian Government, encouraged and supported by the International Federation and the British Cotton Growing Association, and very great progress is now being made. What makes India so important at the present juncture is the fact, vouched for by Mr. Arno S. Pearse,* the Secretary of the International Federation, in the report on his first visit to India, that India is without doubt the country where a large increase of the supply can be most easily and *speedily* attained. It is said that if proper measures were adopted, the Indian crop could be doubled in five years; and, although it would be over-sanguine to hope that any great

Possibilities of great increase.

* Before the European War known as Arno Schmidt.

the best varieties selected and propagated for distribution. At the same time these farms could carry on experiments with regard to fertilizers and methods of cultivation, with a view to teaching the natives to improve their present methods. (3) The establishment of a special Agricultural Department devoted solely to cotton, with a staff of experts acquainted with the best modern methods in the United States and Egypt; and also the maintenance of an efficient staff in each province to supervise and assist locally in all questions connected with seed selection, methods of cultivation, the use of fertilizers, and the ginning and baling of cotton. (4) The establishment of Agricultural Banks. (5) The carrying out of a thorough survey of the existing varieties, with a view to the selection of that most suited to each district, and to its ultimate improvement.

Tree-Cotton Experiments.

Acting in co-operation with the Government of India, the Association voted the sum of £3,000, which, with a similar amount from the government, was spent on certain experiments with tree cottons in Behar. These experiments were, unfortunately, a failure, and it is noticeable that similar experiments carried out in several colonies with Caravonica and other perennial types of cotton have been equally unsuccessful, chiefly on account of the liability of tree cottons to harbour and to suffer from insect pests.

In 1905 the Council voted a sum of £10,000 to be spent by the Government of India in experimental work. Of this amount, the sum of £2,000 was actually spent; but afterwards, in view of the heavy demands on the Association in other colonies, the Government agreed that the

Association should be relieved of any further liability in the matter. Since then the Association has not taken any further practical steps in India.

International Federation.

The International Cotton Federation has during recent years taken a very practical interest in the development of Indian cotton growing. In 1909-10 the Secretary, Mr. Arno S. Pearse, when on a visit to India, primarily with the object of obtaining the affiliation of the Indian manufacturers to the Federation, made an inquiry into the conditions of cotton growing throughout the country. In a report published in 1910 he pointed out the possibilities of development, and the necessity of certain reforms, especially in the direction of improved seed-supply, the setting up of buying agencies, and a proper system of ginning good cotton separately, so as to prevent mixing with inferior varieties. Following upon this, resolutions were passed by the Brussels Conference of the Federation, which were submitted by a large deputation to the Secretary of State for India in July, 1910. This has proved the forerunner of several other similar meetings since.

Reports on India.

In 1911-12 Mr. Pearse again made a tour of the chief cotton districts, paying special attention to the possibilities and conditions of the cotton crop. This was followed up in the winter of 1913-14 by a third visit, in the report of which he has collected the results of all three visits. It is on that report that the details with regard to the Indian crop contained in this chapter are chiefly based. Mr. Pearse's report speaks for itself as to the volume of

work which has been done in India during the last five or ten years, towards the improvement and increase of the crop.

This report, which describes the economic framework of India, as well as the varying conditions of each province as regards cotton growing and the different kinds of cotton grown, will be of great service to the cotton trade by presenting in accessible form a general review of the possibilities of the Indian crop, which was not obtainable before, even in the mass of official publications by different authorities. With Mr. Pearse's similar report on Egypt and the Sudan, it places the cotton world under a great debt to the International Federation.

Enormous extent of India.

India is such an enormous country that its cotton crops vary from one end of the country to the other in every respect, both as to the time and methods of cultivation, and the type of cotton grown. In certain months of the year cotton is at the same time being sown and harvested in different parts of India. The methods of cultivation are, on the whole, exceedingly primitive. Again, the chief factor in the cultivation of cotton, namely the water-supply, introduces an endless variety of conditions. Some parts of the country, principally in the north, are almost entirely dependent on irrigation, while others are supported by natural rainfall. The table on pp. 26 and 27 gives in condensed form as much information as possible about the various districts, the areas under cultivation in each province, the amount and character of the cotton

Varying Conditions.

grown, and the climatic conditions, especially as to rainfall.

It is difficult to co-ordinate the commercial classification of the different varieties of Indian cotton, as given, for example, in the *Liverpool Weekly Circular*, with the names used in India, especially in view of the many new varieties which have come into prominence as the result of modern seed selection, but the following list includes the most important. It is arranged in the same geographical order of the provinces as the table on pp. 26 and 27, so that it may serve as the basis of a survey of the conditions of cotton growing throughout the country.

Different Districts and Varieties.

Beginning with the extreme south of the Peninsula, *Tinnevelly* was the best cotton grown in India until recently. It comes from the southern part of Madras Presidency, near Cape Comorin, and is grown on the black lands there without irrigation. Its staple is about 1 inch, or sometimes a little more, and its price in Liverpool exceeds all but the best Surtee (Broach). It is very white in colour, clean, free of leaf, and strong in fibre.

Madras.

Cambodia, or *Tinnevelly American*, is probably the best cotton now produced in India, and is of great hope for the future. It is grown under partial irrigation in the heavily manured red lands of Southern Madras, round about Madura, Tinnevelly, and Coimbatore. It is supposed to have come from Cambodia in Indo-China, hence the name, but it is undoubtedly of American Upland origin. Its staple is an inch or a little more; it is uniform

Province.	Government Crop Estimates. 000's omitted.						Latitude North.
	1911–12.		1912–13.		1913–14.		
	Area.	Yield.	Area.	Yield.	Area.	Yield.	
	Acres.	Bales.	Acres.	Bales.	Acres.	Bales.	
Madras and Mysore	2,878	335	2,414	471	2,593	513	8°–12°
	101	17	154	19	93	16	
							12°–16°
Hyderabad	3,234	300	2,888	300	3,653	400	16°–20°
Bombay and Baroda	5,121	599	6,064	1,324	6,351	1,397	14°–16°
	665	96	762	196	749	175	
							20°–22°
							20°–22° 21°–23°
Sind	346	124	296	123	332	133	24°–28°
Central Provinces and Berar	4,648	913	4,493	910	4,715	961	19°–25° 20°–22°
Central India ..	1,406	228	1,314	206	1,426	273	22°–27°
Bihar and Orissa ..	88	19	92	19	86	19	20°–27°
Bengal	63	25	51	21	51	13	22°–27°
United Provinces (Agra and Oudh)	921	251	1,158	428	1,586	484	25°–20°
Rajputana and Ajmere Merwara	263	73	393	125	470	132	25°–30°
	27	12	50	26	357	15	
Punjab	1,582	241	1,575	373	2,053	594	28°–34°
North-West Frontier	56	12	56	13	59	14	32°–35°
Assam	36	11	35	10	33	12	24°–27°
Burma	186	32	233	46	288	50	16°–20°
Total ..	21,615	3,288	22,028	4,610	24,595	5,201*	

* Estimated by the Indian commercial community at 6,000,000 bales.

DUCTION BY PROVINCES, 1911–1913.

erage Rainfall n Inches per Annum.	Season. Sowing.	Season. Picking.	Varieties Grown. Name.	Staple.	Price* (Grade "Good")
				Inches.	Pence.
30 South	October	Feb.–July	Tinnevelly	1	6·06
			Cambodia	1–$1\frac{1}{8}$	*7·00*
			Nadam†	$\frac{3}{8}$–$\frac{7}{8}$	—
35 North	Aug.–Sept.	Jan.–Feb.	Western	$\frac{3}{4}$–1	5·25
			Northern	$\frac{7}{8}$	—
			Coconada	$\frac{5}{8}$	*5·19*
	August	April	Western and Coconada	As above	
			Jari and Bani.. ..	See below	
30 Karnatak	August	March–April	Bagalkote	$\frac{3}{4}$	5·12
			Kumptah	$\frac{5}{8}$–$\frac{7}{8}$	5·25
			Dharwar (American)..	$\frac{5}{8}$–$\frac{7}{8}$	5·31
45 Surat (Broach)	July–Aug.	Jan.–March	Surtee	$\frac{7}{8}$–1	*6·31*
			Broach	$\frac{7}{8}$–1	5·81
			Goghari (Deshi) ..	$\frac{1}{2}$	—
45 Khandesh	July–Aug.	Jan.–March	Rosea (Jari)	$\frac{3}{8}$–$\frac{5}{8}$	*5·00*
37 Kathiawar	June	Feb.–March	Bhownaggar } Dhollera	$\frac{1}{2}$–$\frac{7}{8}$	5·06
			Wagad } Dhollera	$\frac{7}{8}$	—
			Rozi† } Dhollera	—	—
7	June	October	Sind (Deshi)	$\frac{3}{8}$–$\frac{1}{2}$	4·06
			,, (American) ..	1–$1\frac{1}{4}$	—
50	June	Oct.–Jan.	Oomra (Jari)	$\frac{1}{2}$–1	5·12
46			Buri	$\frac{7}{8}$–1	—
			Bani (Hinganghat) ..	1–$1\frac{1}{8}$	—
			Rosea	As above	
			Bengal..	$\frac{1}{2}$–$\frac{5}{8}$	4·19
50	May–June } June } June }	October	Jari and Bengal ..	As above	
			Commilla	$\frac{3}{4}$	5·31
East	May–June	Oct.–Dec.	Cawnpore (American)	—	*6·50*
30 West			Bengal and Buri ..	As above	
			Aligarh Rosea ..	—	—
50	May–June	October	Bengal..	As above	
Western area	April	October	American (Dharwar)..	$\frac{7}{8}$–$1\frac{1}{8}$	—
			Hansi	$\frac{5}{8}$	—
			Multan	$\frac{5}{8}$	—
	April–May	Sept.–Oct.	Peshawar	$\frac{7}{8}$–1	—
30	April	Oct.–Dec.	Garo Hill†	$\frac{3}{4}$	—
			Buri	As above	
40 Hills	May–June	November	Shan	1	—
			Wa-gyi	$\frac{5}{8}$–1	—
30 Dry zone			Wa-gale	$\frac{5}{8}$–1	—
			Bhamo	—	—
			Nanking†	$\frac{3}{4}$–1	—
			Thinau-wa†	$1\frac{1}{2}$	—

hese prices are based on the *Liverpool Weekly Circular* of July 10, 1914. Where the price is not tual quotation, it is printed in italics.

• † Perennial or tree cottons.

out-turn.* Efforts have been made to extend the cultivation of Cambodia into Northern Madras, but without much success except where irrigation is available.

Irrigation in Madras is largely by private wells, but irrigation works have been carried out by the government in the deltas of the Godaveri and Kistna Rivers in North Madras, and of the River Cauvery, farther south. Further schemes for irrigation by reservoirs in the Kistna district are under consideration.

Madras Western and *Northern* cottons, inferior to Tinnevelly, are grown in the northern parts of Madras, in the Nizam's Dominion (Hyderabad), and in the south of Bombay Presidency. According to the Madras Chamber of Commerce, their average yield is only about 250 pounds of seed cotton per acre, and the ginning out-turn is frequently as low as 25 per cent., so that the yield of lint per acre is little over 60 pounds. Westerns proper are sometimes longer stapled than ordinary Tinnevelly, and fairly white in colour; but their character and condition are generally inferior, and their value from ½d. to ¾d. per pound less. Northerns are silkier than Westerns, but have a peculiar slightly red tinge, which reduces their value. They are said, however, to have improved greatly of late years. There are considerable complaints about the mixing of these varieties.

Coconada Red is grown chiefly in the valley of the Kistna River, which forms the boundary-line between

* Mr. Pearse attributes this to the impossibility of adequate supervision on the part of the Government Agricultural Department of Madras, which seems to be very much understaffed.

Madras and Hyderabad, and was named after the port of Coconada, on the Indian Ocean, from which it is chiefly shipped. It is similar to the Madras Northerns above described, but only about $\frac{5}{8}$ inch in staple, and of the same reddish colour. It is, however, a much heavier yielder than Westerns; the yield is 500 to 600 pounds of seed cotton per acre, and the ginning out-turn 25 to 35 per cent. It is very noticeable throughout India that a high ginning out-turn is always of the first importance. The buyers seem to regulate their prices by this alone, often to the entire disregard of length of staple. This has probably a great deal to do with the inveterate habit in all parts of India of mixing cottons of different staples. The ginners and merchants seem to have no conception of the importance of uniformity of staple in cotton, and of the fact that the value of cotton depends on the shortest staple it contains.

Neglect of Staple.

Mixing.

Passing northwards into Bombay Presidency, the district which stretches eastwards from the inland slopes of the Western Ghats produces a variety of Madras Western cotton, known as *Bagalkote*, after a town of that name. In value it is about the same as Coconada—that is to say, about 1d. below Tinnevelly.

Bombay.

Dharwar cotton is also called after a town in the same district, round which it is specially grown; it is generally spoken of as Dharwar American. It was, as a matter of fact, imported from America, probably about 1840, when the East Indian Company was making great efforts to introduce Orleans cotton into India; and thus is the relic of one of their few successes. Its staple is from

$\frac{5}{8}$ to $\frac{7}{8}$ inch, and its value about $\frac{3}{4}$d. per pound less than Tinnevelly. The Government Agricultural Department is replacing it by Cambodia in the dry districts. Though the yield of the latter under these conditions is much less than in Madras, it is nearly twice as much as Dharwar, and the ginning out-turn is about 10 per cent. better.

Comptah, or *Kumpta*, is the old native type of cotton, grown in the same district as Dharwar (*i.e.*, South Bombay), with which it is often mixed. It is named from the port of Kumpta on the west coast, by which it is exported. Its quotation in Liverpool is usually only a fraction less than Dharwar. Its staple is $\frac{3}{4}$ to $\frac{7}{8}$ inch; it has a dull fibre, but strong, and the quality is fine, like ***Broach***. The ginning out-turn, however, is only 27 to 29 per cent. The Agricultural Department is pushing Broach in the best parts of the district, as it gins 33 per cent., and is better in colour. It also picks cleaner, as the bolls are more open and larger than those of Dharwar. There is a great deal of fraudulent mixing in this district, of Broach or Dharwar with Kumpta on the one hand, and of Kumpta with inferior cottons from the Deccan and even waste from the mills, on the other.

Surat.

Surtee and *Broach*, the best varieties of Surat cotton, are grown in the districts round Surat and Broach in South Gujarat, at the mouths of the Rivers Tapti and Narbada, North of Bombay. Attempts are being made to introduce Broach in various other districts in place of inferior local varieties. It is probably the average or medium type of Indian cotton, midway between the common native Bengal cotton of all Central India and the best, Cambodia. Its staple is about $\frac{7}{8}$ to

1 inch, and its value in Liverpool about 75 to 100 points ($\frac{3}{4}$d. to 1d.) below that of American Middling. The finest Broach is grown near Nausari, south of Surat. The cultivators of the Surat-Broach district are said to be the most careful in India. There is, however, a good deal of fraudulent mixing of inferior cottons, such as *Deshi*,* the common inferior cotton grown in the Surat district, and *Goghari*, with the finer growth. Goghari is shorter in staple than Broach, but of a bright white colour, and is noted for its high ginning out-turn. It is grown in the northern parts of the Broach district. In 1911 the Bombay mill-owners, on the suggestion of the International Cotton Federation, established a buying agency in Surat to encourage the growing of improved Broach cotton; but recently they have complained that the cotton thus obtained is no better than the ordinary, in spite of the premium paid. The Surat Government Farm is also doing excellent work in selecting and raising improved strains.

Broach.

Khandesh is also a mixture of different varieties grown in a district of that name in Bombay Presidency, lying east of Surat in the northern part of the Deccan, and is worth about $\frac{3}{4}$d. less than Broach. The preponderating variety is *Rosea*, with a staple of $\frac{3}{8}$ to $\frac{1}{2}$ inch. It is very bright and white in colour, but of coarse fibre, and is known locally as *Warhadi*.

Bhownaggar **(*Mathio*) is a degenerate variety of *Dhollera*, but possessing early maturity and a high ginning out-turn. It is grown in the Kathiawar Peninsula, Gujarat, in the north of Bombay Presidency. Dhollera also includes a**

* Meaning "local."

number of other varieties. Of these *Wagad* is peculiar in that the bolls are plucked bodily from the plants, and the seed cotton extracted by the cultivators at leisure in their houses. *Lalio* is identical with Broach, and under well irrigation yields a similar cotton. It is frequently mixed with Wagad. Goghari is grown unirrigated, and yields better than Lalio on an insufficient water-supply, but is coarser in fibre, like Wagad. *Rozi* is perennial and is left on the land for three or four years. Dhollera is largely consumed in the local mills of Ahmedabad. Bhownaggar fetches about ¾d. per pound less than Broach in Liverpool. The staple varies from ½ to ⅞ inch.

Sind.

Sind (or *Scinde*) *Deshi* cotton is the local native type grown under irrigation in the lower part of the Valley of the Indus. It is similar to *Jari*, but yields five to ten times as much per acre, owing to irrigation. Though only ⅜ to ½ inch in staple, it seems most suitable for this district because of its earlier maturing character than Broach (five months against eight), which is necessary owing to the occurrence of frost in January. Its price is among the lowest of Indian cottons, about 1¾d. per pound below Broach. It is, however, very white, and is frequently mixed with American cotton in spinning to improve the colour of the latter.

Experiments have also been made with Egyptian and American cotton in Sind. The former has not so far been a success, owing to the lack of a suitable irrigation system, which, however, can be remedied, and also on account of the difficulty of getting it properly cleaned, ginned, and baled, and of securing an adequate price for it. American long staple upland cottons have, however, proved very

suitable for Sind, as their growing period is even shorter than that of the native variety, and they require less water than either that or the Egyptian. There are very large tracts of land available for the growth of American cotton in Sind along the inundation canals; but the difficulties of securing proper handling and also of preventing fraudulent mixture were at first very serious. To meet these, a syndicate has been formed by the Bombay Mill-Owners' Association (again on the suggestion of the International Federation), which has established a buying agency, erected modern gins and presses, and made arrangements for selling the cotton in Bombay.

The possibilities of development of cotton growing in Sind are bound up with the progress of irrigation, which is being pushed on rapidly by the government, for Sind is practically rainless—about 5 inches of rainfall per annum.

Irrigation.

At present in many cases only from one-third to one-fifth of the land is under cultivation each year for lack of water. The remainder lies fallow, and the fields are entirely untouched for four or five years, even the cotton sticks being left standing, to harbour insect pests if one may judge from Egyptian experience. But the chief part of the proposed irrigation schemes—the Rohri Canal—has been "under consideration" for about fifty years, and so far only inundation canals are available.

Oomra, or *Oomra-Wuttee*, so called after a town of the latter name (generally spelt Amraoti or Amraouati) in Berar, is largely grown in that and the Central Provinces. It includes a number of different varieties, the mixture of which is known as *Berar Jari* or simply *Jari*. This is probably the most widely spread cotton

throughout India. Its value is about the same as Bhownaggar—that is to say, about ¾d. below that of Broach.

Central Provinces.

The staple varies from ½ inch for the short varieties to ¾ or ⅞ inch for the long. There are, however, two superior varieties—*Buri* and *Bani*—which are of longer staple. Of the former about 1,500 bales were grown in 1911, and the whole crop is taken regularly by a Nagpur spinning mill. This is like Dharwar American, a relic of early experiments in the introduction of American cotton into India. It is said to have been originally a Georgia upland variety. Bani is a silky, fine cotton of 1 inch staple. It was largely exported at one time under the name of *Hinganghat*, but the yield per acre is less than that of Jari, and the ginning outturn only 26 per cent., against 35 per cent. for Jari, so that it does not pay the cultivator. Large quantities of such long staple cottons as Bani and Buri could, however, be grown in the Central Provinces and Berar, if the prices obtainable for the lint could be made more remunerative to the grower.

Bengal cotton is grown in Rajputana, Central India, and the United Provinces (Agra and Oudh), and to a

Bengal.

small extent in the province from which it takes its name. It ranks with Sind Deshi as the lowest in value of the Indian cottons quoted in Liverpool. One variety known as *Comilla*, from a town

United Provinces.

of that name in Eastern Bengal, apparently fetches in Liverpool about the same price as Kumpta or Dharwar: the others go as low as Sind Deshi. Their staple is only ¼ inch to ⅜ inch. In the United Provinces, however, the Agricultural Depart-

ment is doing good work in improving the general character of the crop and introducing new varieties. Recent experiments with American cotton here seem to promise some success, though former efforts in this direction had to be abandoned.

A variety similar to Comilla, known as *Garo Hill* cotton, is also grown in Assam, where it shows a very heavy ginning out-turn, as much as 50 per cent., but of poor staple, and coarse. It is of a very harsh character, which makes it useful for mixing with wool, and steps are now being taken to develop this. This district, owing to its comparative nearness to the sea, has a very warm and humid climate, and judging from the extraordinary luxuriance of the vegetation, ought to grow almost anything. Experiments are also to be made with Cambodia cotton. Experiments have shown, however, that good Buri cotton from the Central Provinces could be grown in Assam, in certain parts of the Brahmaputra Valley.

Assam.

In the Punjab—the land of the five rivers—several native types of cotton are grown, of which two, known as *Hansi* and *Multan*, are comparatively good. They are fully $\frac{5}{8}$ inch staple, and yield about 600 pounds of seed cotton per acre, with a ginning out-turn of about 33 per cent. Some growers have increased these figures to $\frac{7}{8}$ inch staple and 40 per cent. ginning out-turn. It is said that a good deal of this cotton is sold in Europe as Surtee Broach.

Punjab.

Great progress has also been made in the Punjab with Dharwar American seed, which seems to do even better here under irrigation than in its original home in South

Photos by *A. S. Pearse.*

IRRIGATION IN INDIA.

1. THE BULLOCKS PULL UP THE BUCKET BY WALKING DOWN THE SLOPE.
2. LIFTING WATER BY HANDBASKETS.

Bombay; and in 1913 the crop is said to have amounted to between 35,000 and 40,000 bales. There is, however, a deplorable amount of mixing with the native cottons going on, which prevents the superior variety reaching its due price.

The Western portion of the Punjab, which contains 80 per cent. of the cotton growing area of that province, is practically rainless, but great irrigation works are in progress which will still further increase the area available for cotton growing. Thus the Triple Canal Project, which includes the Upper Jhelum, Upper Chenab, and Lower Bari Doab Canals, is to cost nearly £7,000,000 and to irrigate about 2,000,000 acres. At present, owing to shortage of summer water, only about one-fourth of the area available can be cultivated during each "hot weather," even in irrigated districts. Nevertheless, there have already been signs of water-logging of the soil in certain districts, due to excessive irrigation.

Irrigation.

The International Federation has had under consideration a scheme for taking up a large concession of about 7,500 acres in a newly canalized district on the Lower Bari Doab Canal, for the purpose of running a model plantation on a large scale. The estate will be worked by native tenants on the local half-share system, and everything possible will be done to introduce up-to-date methods of cultivation and handling of the crop. The estate will also be used as a centre for the propagation and distribution of selected seed. This scheme, however, will probably be delayed by the War.

To the north and west of the Punjab, beyond the Indus,

lies the North-West Frontier Province, where some cotton is already grown under irrigation, partly by canals and partly from the hill streams. The area under cultivation is limited to the valleys and plateaus, and where canal irrigation has not been provided, it depends on the supply of water in the hill streams in the spring for sowing purposes. The supply is always available later on in July, but that is too late for cotton. The local variety is good cotton, being longer than *Punjab* cotton, but though the yield is heavy, as much as 500 pounds per acre, it gives a very poor ginning out-turn—only 25 per cent. Here, as elsewhere throughout India, all sorts and conditions of cotton are ginned together. The habit of damping the kapas, or unginned cotton, is also very prevalent, and does great damage, the cotton becoming discoloured and quite stale. The result is that *Peshawur* cotton has acquired a very bad reputation

North-West Frontier.

Large sums have already been spent on irrigation in this province, and further schemes are now in progress, one of which involves the cutting of a tunnel over two miles long under the Malakand Pass. This is now nearly completed. The scheme will irrigate 381,000 acres, and should lead to a considerable extension of cotton growing in the district.

About 1,000 bales of excellent cotton are brought into India through the North-West Province from Afghanistan every year. There are several varieties, of which the best, *Kabul*, is said to be as good as Cambodia.

Perennial or Tree Cottons of various kinds are also grown to a considerable extent in many parts of India—*e.g.*, Rozi in North Gujarat and Dharwar; *Nadam*

similar to Rozi, in Madras on light soil; and *Deo Kapas*, the sacred tree cotton usually grown near the temples and used for spinning the sacred thread. The general opinion seems to be, however, that tree cottons had better be abandoned, chiefly on account of their harbouring insect pests.

Tree Cottons.

In Burma there are three different classes of cotton grown, as follows: (1) *Shan* cotton, the staple of which is about 1 inch in length, is grown on the hills of the Shan and Chin States, east and west of the Irrawaddy; and *Wa-gyi*, meaning "late cotton," on the hills near Prome farther south. Its staple is about $\frac{5}{8}$ to 1 inch. The ginning out-turn of these two is very high—nearly 40 per cent. (2) Others of about the same staple as Wa-gyi are grown in the Dry Zone, the central basin between the Chindwin and Irrawaddy rivers. Of these the most common is *Wa-gale*, which constitutes the vast majority of the Burma cotton crop. It is fairly white and of good strength. Another variety, known as *Bhamo*, would, it is said, be as good as the best Surtee Broach if properly handled. There is also a very inferior variety of red *Khaki* cotton. All these seem to be mixed indiscriminately. (3) There are also two varieties of tree cotton, the one known as *Nanking*, with a staple a little longer than the last-mentioned varieties, and the other a Brazilian (Pernambuco) tree cotton or kidney cotton known as *Thinaw-wa*, with a staple of about $1\frac{1}{2}$ inches, silky, and fairly strong, grown near Moulmein.

Burma.

The prospects of development of cotton growing in Burma seem now to be fairly promising, though there are

still difficulties. The Burman will not grow cotton on land which is suitable for rice—*i.e.*, on irrigated land. The precarious character of the seasons, the cost of labour and transport, and the inferiority of the staple of the indigenous varieties all present difficulties. This last, however, is now in a fair way to be tackled. The Government Department of Agriculture is taking up the question of experimental farms, and experiments made with Cambodia cotton have been very successful. The recent formation of a combine among the owners of the ginning factories, which has cut down the prices paid to the growers, threatens to divert the natives to other crops. There seems little doubt, however, that good cotton could be grown. The crop of 1912, estimated by the Government at 46,000 bales, was placed by local merchants at nearer 75,000 bales.

The practice with regard to ginning, baling, and pressing varies all over India, as much as the varieties of cotton grown. In most parts the ginners buy the seed cotton before ginning, but in the south the ginners, who are also the exporters, buy the lint only after ginning. In Dharwar, on the other hand, the ginners mostly work on commission only, and do not buy the cotton at all. In the south, again, many of the spinning mills have a ginnery attached, as in some of the southern mills in America. In Southern India, as already mentioned, the bale is 500 pounds. It is well pressed, the exact density given varying according to the destination of the bales. Those for Europe are most heavily pressed. Roller gins only are used in the south, and, indeed, in

Ginning.

Photos by *A. S. Pearse.*

1. A GINNERY YARD IN INDIA.
2. LOADING COTTON ON A RIVER STEAMER IN BURMA.

most parts of India, but for Dharwar American cotton these have been entirely replaced by the American saw gin, which is much faster, giving as much as 30 per cent. more output. In many of the more important cotton growing centres the European export houses have their own ginneries. In the Punjab, however, the ginneries belong entirely to native firms, who buy the seed cotton from the " bania " or small merchant* (and money-lender) and are said to speculate largely in cotton. In the United Provinces only roller gins are used, and the ginneries are mostly in the hands of native firms, who either buy from the bania, or gin on commission. Hand gins are probably only used now in the natives' homes for cotton intended for domestic consumption. Some growers, however, prefer the "churka," or native roller hand gin, for ginning their seed cotton for resowing, as the saw gin is said to damage the germinating point at the tip of the seed.

In some districts the ginneries are in the hands of local people, and are small and primitive, labour-saving appliances such as automatic cotton conveyors being unknown. In Surat, however, most of the ginneries are in the hands of substantial people, and many of the Bombay traders are interested in them. The Bombay Mill-Owners' Buying Agency hired one of the gins specially for the handling of the improved Broach cotton. It is in the ginneries that the mixing of cotton frequently spoken of above is carried on. Another most objectionable practice is the deliberate watering of the ginned cotton, and in some districts of unginned cotton, to increase

Damping.

* This system is also found in Uganda run by Hindus.

the weight. This seems to be done quite openly with a hose in the Central Provinces and Berar, in the case of ginned cotton, and, in the North-West Province especially, of kapas, by such a simple process as rolling the bags in a stream on the way to the ginnery.

Many of the ginneries are too small to own a steam press, and the loose bales of ginned cotton are either half pressed by old-fashioned screw presses, or sent by rail to the nearest steam press. In any case, the bale is generally pressed twice, first into what are called half bales, and then by the finishing press into export bales by steam or hydraulic power. In Sind and the Punjab this is done, even though both presses are in the one building, but in the United Provinces the cotton is pressed into export bales at once, without the intermediate pressing into half bales.

Double Pressing.

By far the largest proportion of the Indian crop is sent to Bombay, where it is mostly stored in the open-air on the "Cotton Green." Hundreds of thousands of bales are lying in stacks neatly packed, but entirely unprotected from the weather and exposed to serious risk of fire. The Bombay Cotton Trade Association, Ltd., has its Exchange or Sale Rooms on the Cotton Green, and its rules and regulations govern all cotton transactions. Cotton from the Madras Presidency is shipped via Madras and Tuticorin.

Marketing of the Indian Crop.

The distribution of insect pests throughout the various cotton districts is again very local. Thus the boll-worm does not do as much damage in the Central Provinces as

in the Punjab and other parts of India. Surat again is comparatively free from insects, and in Dharwar they have not caused great damage, though the boll-worm makes itself felt occasionally. Parasites and trap crops have been tried extensively in the bad boll-worm districts, but so far with only partial success. The presence of perennial or tree cottons, in which the insects harbour, certainly helps to maintain the supply from year to year, as also does the practice—*e.g.*, in the United Provinces—of merely cutting the withered cotton-stalks to the ground, leaving the roots to be ploughed in with the next year's crop. This practice was condemned in Egypt.

Insect Pests.

The statistical system in India is far from satisfactory. Every village has a map kept by a native official, on which the various crops are noted each year, and this map is sent periodically to the Commercial Intelligence Department in Calcutta. The ascertained production of a selected plot of one-fifth or one-tenth of an acre in each district is taken as an average crop, and the estimated acreage in each district as marked on the map is multiplied by the figure thus obtained. Many experts agree that the result is a mere guess. The difference between the figure obtained in this way and the real facts may, according to the opinion of those who compile them, vary from 20 to 25 per cent. Generally the figures of the Commercial Intelligence Department are too low. (See Table D, I., in Appendix.)

Statistical Returns.

The International Cotton Federation has suggested that a system of fortnightly Ginners' Reports, similar to

that in use in the United States, should be adopted in India. In view of the fact that hand-ginning, which not long ago accounted for 20 to 25 per cent. of the crop, is now fast dying out, such a scheme seems quite feasible, and it would certainly be of great advantage to all concerned. The Commercial Intelligence Department has now taken the matter in hand, and an effort to introduce such a scheme will probably be made shortly. The chief difficulty lies in the Native States, where a large amount of cotton is grown, as the native governments cannot be forced to supply any statistical information. Some of the more enlightened of them, however, are now recognizing the importance of higher agricultural work, and have established Agricultural Departments sometimes even under European experts, and from many of these returns would probably be forthcoming.

Proposed Ginners' Returns.

The possibility of checking the production by statistics of consumption is unfortunately limited by the fact that, in addition to the mill consumption, of which the International Federation Statistics have since 1909 been fairly complete, and the export statistics, there is a very large domestic consumption. The amount of this has been estimated at from 450,000 to 1,000,000 bales per annum.

Domestic Consumption.

The following table gives details of the export of Indian cotton and the countries to which it goes. It also gives a few figures indicating the extent of India's manufacturing industry and of her exports and imports of manufactured cotton goods.

INDIA'S COTTON TRADE.

Founded on the Statistical Abstract for British India [*Cd.* 7799].

		1908–09.	1909–10.	1910–11.	1911–12.	1912–13.
Total crop*	000 pounds	1,680,060	1,971,200	1,721,200	1,601,600	1,730,400
Indian yarn production†	,,	629,886	593,424	576,996	590,842	650,565
EXPORTS.						
Raw cotton	000 pounds	761,422	1,004,421	972,877	820,795	826,281
To Japan	per cent.‡	34·0	38·0	34·0	48·0	51 2
,, Germany	,,	16·8	13·7	15·4	11·3	11·7
,, Belgium	,,	12·6	11·4	12·2	10·2	11·1
,, Italy	,,	12·4	10·4	12·4	9·5	7·7
,, Austria	,,	5·9	7·9	8·1	6·6	5·3
,, United Kingdom	,,	5·1	5·9	6·8	6·1	3·8
,, Other countries	,,	13·2	12·7	11·1	8·3	9·2
Cotton yarn	000 pounds	235,469	227,364	183,425	151,489	203,961
To China	per cent.‡	88	87	86	84	89
Piece goods	000 yards	78,019	94,167	99,837	81,540	86,519
IMPORTS.						
Raw cotton	000 pounds	14,055	10,527	5,072	54,073	61,384
Yarns	,,	41,524	40,300	32,504	41,959	50,035
From United Kingdom	per cent.‡	91·5	91·5	91·5	88·8	88·0
Piece goods	000 yards	1,994,211	2,194,734	2,310,566	2,440,065	3,025,140
From United Kingdom	per cent.	92·3	92·3	91·8	92·0	—

* Including some of the Native States, which are otherwise excluded.
† For Federation statistics of spindleage and consumption, see Table B. III.
‡ Based on the "value" statistics; for others based on quantities, see Table D, II., in the Appendix.

From this table the following points may be noted: (1) A little more than half of the total crop is exported. Of this, Japan takes the chief share, now nearly half of the total exported, and her share is increasing rapidly. (2) India also exports a considerable quantity of yarn, apparently about one-third of her total production, though the proportion is decreasing markedly. Of this export, the great bulk goes to China treaty ports and Hong-Kong. From the latter a good deal is probably transhipped to Japan. (3) India imports a small quantity of raw cotton, mostly American, a little cotton yarn, and an enormous quantity of manufactured cotton goods. Of the last two, over 90 per cent. comes from the United Kingdom.

The price of Indian cotton, as will be seen from the tables in Appendix F and the corresponding diagrams, tends to follow that of American very closely At the same time there is, on the whole, a tendency for the discount on the Indian staple to diminish; since 1900 the price has been coming closer again to that of American.

Rotations and Cereal Crops.

With regard to the general economic conditions of India, so far as they react on the cotton crop, there are endless points of interest which, however, can only be indicated. The question of rotation of crops, and the possibility of the development of cotton growing interfering with the home-grown food-supply of India, has been much discussed. If, however, one may judge from experience in Egypt, the native cultivator is very quick to realize how his own financial interests may best be served, and if he finds that it pays him better to grow cotton, and buy wheat, millet,

and rice, which constitute his food-supply in different parts of the country, he will certainly do so in spite of any obstacles the government may attempt to place in his way, and he will probably be right.

As a cotton-growing country India has many great advantages. In spite of her enormous area she is fairly well supplied with means of communication, especially by rail. Her population is enormous, with a density per acre in certain parts which is unequalled in any agricultural country in the world. Most of the native races are born agriculturists, and although their standard of living has in the past been very low, they are quick to recognize the possibility of improving it, as cotton growing enables them to do. Every additional bale of cotton that India produces means not only more raw material to the cotton industry, but also more demand for cotton goods, either of Indian or European manufacture. From our point of view—that of the search for an increased cotton supply—this may appear rather a vicious circle, but from the point of view of India it is an unmitigated advantage. That advantage is now being fully realized The Co-operative Societies, for example, which have done so much to improve the status of the agricultural population of India, are now taking up the question of seed-distribution and the handling of the cotton crop generally, including the provision of proper ginning facilities. There is also a great deal of work for them to do in providing and encouraging the natives to use improved modern implements. In certain districts the use of deep ploughs

Railways.

Labour Supply.

Co-operative Societies.

Ceylon.

There seems to be little doubt that parts of Ceylon, especially the northern portion of the east coast, are suitable for cotton growing under irrigation. The chief difficulty seems to be that, owing to the recent boom in rubber, labour and capital have been diverted to the southern part of the island, where favourable conditions for that crop are found, but labour might be imported from Southern India, and the present high price of cotton contrasted with the fall in rubber should make cotton growing a more attractive investment.

Irrigation.

Mr. J. S. J. McCall, who was formerly in Egypt and is now Director of Agriculture in Nyasaland, in a Report on Cotton Growing in Ceylon, published in 1909, prognosticated a great future for cotton in the dry zones of Ceylon during the warm weather, provided the water is conserved and distributed to the many acres of fertile land which are at present largely jungle. There are nearly 200,000 acres of irrigable land, of which only 75,000 acres are under cultivation. In the North Central Province alone there are over 2,000,000 acres awaiting the plough. The soil is ideal for cotton, and closely resembles the black river bottoms of Texas, being a dark alluvium with a high retentive power for water. The rainfall is about 50 inches per annum, but falls mostly during the winter.

The government has found that Egyptian, Sea Island, and American Upland cottons can all be grown in Ceylon, but Egyptian gives the most profitable returns. It stands

the heat better than American, and requires a long summer to mature.

The export of cotton from Ceylon in 1912 was 140,171 lbs., say 280 bales.

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CHAPTER V

CHINA, JAPAN, AND INDO-CHINA

Conflicting estimates of Chinese crop—Domestic consumption—Local factories—Exports and imports—Native and American varieties — Chief cotton districts — Damp — Japan and Korea—Indo-China and Siam.

IT is exceedingly difficult to get any reliable idea of the amount of the cotton crop in China, partly because cotton cultivation is spreading so fast throughout the country, in spite of its unsettled condition during the last few years, and partly because of the same difficulty as in India—viz., that a large part of the crop (formerly estimated by different authorities at from 400,000 to 1,850,000 bales per annum) is devoted to domestic consumption, and therefore never comes within reach of any possible statistics. Estimates even of the commercial crop, that is to say, the local factory consumption and the exports, are very conflicting. That of the American Bureau of the Census in "Cotton Production," 1913, was 1,200,000 bales of 500 lbs. each, a larger amount than for any previous year, and probably too high; but Messrs. Noel Murray and Co., Ltd., of Shanghai (quoted in Shepperson's "Cotton Facts," 1913), estimated the average commercial crop at 750,000 bales. Subsequently, the Chinese Minister of Agriculture an-

Statistical Difficulties.

Domestic Consumption.

nounced that investigations made throughout the provinces showed an annual production for the years 1909 to 1912 of 4,181,333 bales, while Noel Murray and Co. estimated the total crop of 1912 at 5,330,000 bales of 500 lbs.

Local Manufacture.

As far as the world's markets are concerned, however, the chief fact to be noted is that the greater part of the crop is consumed in China itself, either for domestic cloth-making, including wadding of garments, or in the local mills. The latter are said to contain about a million spindles, and to consume about half a million bales of native cotton per annum, in addition to a small quantity of imported staple.

Exports & Imports.

About a quarter of a million bales may be taken as the average export from 1909 to 1913. Most of the cotton exported goes to Japan, though America and Germany are taking an increasing share from the North (Tientsin), and apparently some of the best of it comes to Liverpool, for it is occasionally quoted in the lists there at about the price of American Middling.

China imports a little raw cotton for her mills, mostly from India. She also imports about 300 million pounds per annum of cotton yarns for manufacturing purposes, mostly from India and Japan. The way in which the latter's share of this trade is increasing at the expense of the former is typical of Japan's position in the cotton markets of the Far East.

The following table gives the imports and exports of raw cotton, according to the trade returns of the China Maritime Customs, the figures being converted into bales of 500 lbs. It also gives the imports of cotton yarns

in thousands of pounds, and the relative shares of India and Japan in that trade.

Year.	Raw Cotton.		Cotton Yarns.		
	Exports.	Imports.	Total Imports.	India.	Japan.
	Bales.	Bales.	000 Lbs.	Per Cent.	Per Cent.
1909	168,893	30,503	320,815	70	28
1910	332,614	54,910	304,330	57	41
1911	234,065	10,580	248,017	57	41
1912	214,856	74,451	306,464	56	41
1913	197,017	35,535	358,048	50	48

Great improvements have recently been made in the quality of the Chinese crop. The ordinary indigenous cotton is of the usual native type in Asiatic countries, similar to the lower grades of Indian cotton, and the methods of cultivation are very primitive. It is said that the plants are sown very close, making them small with few branches and small bolls, many of which wither for lack of sunshine. The cultivators collect the ripe bolls bodily from the plants (like *Wagad* cotton in Central India) and remove the seed from the lint at their leisure by very primitive appliances. The lint is described as clean and white, but the staple is generally very coarse and short, averaging about $\frac{5}{8}$ inch.

Modern Improvements.

Native Type.

The methods of cultivation adopted are apparently fairly intensive, though very ancient. Small holdings are the rule, and the planters are men of small means, with no money to spare for artificial fertilizers. They make the fullest use, however, of whatever natural manure they can obtain. The soil

Methods.

is of a loamy character, and is very easily worked, usually with a two-handed wooden plough, tipped with iron or steel, and drawn by oxen or buffaloes. The depth of the furrow is seldom more than 15 inches.

A peculiar system of rotation of mixed crops is apparently common. Wheat is first sown, and by the middle of May, when it is nearly ready for reaping, cotton seeds are dropped among the wheat stalks, light soil being scattered over them as a covering. At the end of May the wheat crop is gathered, the stalks being left a few inches higher than the growing cotton, which by this time will be about ½ inch out of the ground. When the cotton plants are about 6 inches high, the ground is hoed and brought round the roots, and they are thinned out to a distance of 7 or 8 inches apart. During the growing season weeding takes place at intervals, and with good weather the flowers begin to appear at the end of July, and the bolls are formed about the end of August. The rainfall is on the whole ample, but its distribution throughout the growing season is rather uncertain, and at times the crop may be seriously damaged by a too dry summer or a too wet autumn.

Mixed Cropping.

When the bolls begin to open, they are collected, and the cotton carefully picked out afterwards. It is probably due to this method that Chinese cotton is said to be much more free from leaf than Indian. The latter, however, is imported for the mills in China, when exchange is sufficiently favourable, in order to get better length of staple. In a late season the harvest may continue to the middle of November. Sometimes a third crop is obtained in the year by sowing

Picking.

beans among the cotton in the middle of October, and when all the cotton has been picked, the stalks are pulled up, leaving the beans to grow through the winter, for cutting in the following April. The bean stalks and leaves are then ploughed into the ground as a fertilizer.

Yield.

The yield of the crop is said to average from 640 to 1,600 lbs. of seed cotton per acre, according to the season.* Another authority† says that where the land is used only for cotton growing, with proper fertilizing, the average is probably about 1,000 lbs. per acre; but when grown with wheat as a rotation crop, the yield averages only 680 lbs. These figures, it will be noticed, put China far above the American average of 500 to 600 lbs. of seed cotton per acre, and out of all comparison with the Indian, which, on the whole, is below 300 lbs.

Ginning and Baling.

The ginning is done chiefly with Japanese gins, only about 20 per cent. being ginned by hand. The ginning out-turn is stated at from 33 to 36 per cent. The baling process is very simple. Four short poles are driven into the ground, and to these are attached bags made of nankeen, capable of holding 80 to 160 lbs. A man stands inside the bag, and as the cotton is put in, tramps it down with his feet until it is fully packed. The bag is then bound with hemp rope, and is ready for shipment. A similar method is still in use in the Sudan.

Since 1908 great efforts have been made to improve and extend the cultivation of cotton throughout

* Consular Reports, Ningpo (1912), No. 5,201.
† Kerfoot (see p. 63).

China, and to introduce American seed. This movement has been partly due to the desire to find a profitable crop to take the place of the poppy, owing to the suppression of the opium trade. The Imperial Government has pressed the matter on, and local bodies of all kinds have taken it up enthusiastically.

Use of American Seed.

Two main areas, in North and Central China respectively, are the chief contributors to the crop. The former includes the provinces of Chihli (with the capital, Peking, and the port of Tientsin), Shansi, Shensi, Honan, and Shantung, with its port of Tsingtau,* now rising to considerable importance. This area includes the valley of the great Yellow River, or Hwangho, to the West, and the districts along the Grand Canal southwards. The second cotton area is the valley of the Yangtse-kiang River, which, practically from its source in Tibet to the sea near Shanghai, is traversing land available for cotton growing, and much of it already producing cotton. There is also a considerable acreage of cotton in the coastal districts round Hangchow and Ningpo. There ought to be good cotton land in the valley of the West River, in the south of China, which finds its way to the sea at Canton, but nothing seems to have been done towards developing this part of the country. In the extreme south-west corner of China, however, in the province of Yunnan, a certain amount of cotton is grown in the upper basins of the rivers running south into Indo-China.

Cotton-Growing Districts.

* At the mouth of Kiaochau Bay, formerly part of the German Protectorate of that name.

The possible extension of cotton growing in China is therefore simply immense, and enough has already been done to show that the quality of the crop can be very much improved. Good American cotton of 1 inch staple is being produced, which comes into competition with the best Indian varieties and the lower American grades, which form the bulk of the consumption of the Chinese and Japanese mills.

Possible Developments.

The way in which the artificial damping of cotton was handled in China may be taken as an illustration of the earnestness and efficiency with which the question is being taken up. For many years complaints had been made on the subject until 1910, when an Anti-Adulteration Association was set up in Shanghai by the dealers, resulting in the establishment of a testing-house, where all cotton is inspected and rejected if found to contain more than a fixed percentage of moisture. Twelve per cent. was set as the standard, because the Japanese buyers, with their damp climate, do not regard it as excessive. The testing-house has a staff of some fifty persons, comprising Europeans, Japanese, and Chinese, under European management, and in it all cotton is examined prior to the issue of export certificates. "For cotton found to contain below 12 per cent. of water a 'below standard' certificate is issued; when 15 per cent. is exceeded, a certificate is refused. The testing-house can deal with 5,000 to 7,000 samples a day, with the prospect of being able to handle more than that quantity if business warrants its extension."* A similar association has been formed at Tientsin, where testing-houses

Artificial Damping.

* Consular Report, No. 4,975, Kobe, 1911.

have been set up at the native Customs barriers (inland), and no cotton is allowed to enter the port for shipment if it transgresses the limit. Owing to the dry climate in the districts served by Tientsin, the natural percentage of moisture is only about eight. The system is enforced by the authorities of the Maritime Customs, with the consent of the foreign representatives in Peking. Testing-houses at Tsingtau and Hangkow are also under discussion.

There seems, therefore, to be good ground for hoping that, if the awakening of China brings to the world's markets an enormous accession of demand for cotton goods, it may also bring with it possibilities of an increased supply which will go far to meet the new demand.

JAPAN.

Japan is rapidly becoming the Lancashire of the Far East. As will be seen from the following table, her consumption of raw cotton from all parts of the world is now well over 1,500,000 bales per annum, and her spindles over 2,000,000. Her imports of manufactured cotton goods from other countries are decreasing even more rapidly than her exports to other countries are increasing.

Manufactures.

Japan is also like Lancashire in that she produces hardly any of the raw material she uses. In Japan itself there is still a small quantity of cotton grown mostly in the south, but the total amount is now negligible. In Korea, however, which came under Japanese suzerainty after the Russo-Japanese War, and became definitely a part of the Japanese Empire in 1910,

Korea.

JAPAN'S COTTON TRADE.

	1908.		1909.		1910.		1911.		1912.		1913.	
	Tons.	Total.	Tons.	Total.	Tons.	Total.	Tons.	Total.	Tons.	Total.	Tons.	Total.
Imports (*Raw Cotton*).		Per Cent.		Per Cent.		Per Cent.		Per Cent.		Per Cent.		Per Cent.
From India	89,948	45·0	137,959	58·0	184,375	62·5	144,167	58·4	190,430	52·5	238,361	59·8
,, United States ..	47,609	24·0	42,562	18·0	26,470	9·0	43,855	17·8	111,442	31·0	102,385	25·6
,, China	39,245	19·8	36,431	15·4	67,810	23·0	44,156	17·9	39,145	10·8	34,241	8·6
,, Egypt	5,798	2·9	6,119	2·6	4,418	1·5	5,978	2·4	6,902	1·9	7,410	1·9
,, Korea	920	0·5	1,632	0·7	2,220	0·8	900	0·4	*	—	*	—
,, French Indo-China	*	—	*	—	3,181	1·1	2,851	1·1	9,195	2·5	9,282	2·3
,, Other countries ..	15,526	7·8	12,524	5·3	6,359	2·1	5,001	2·0	4,596	1·3	7,266	1·8
Total tons	199,046		237,227		294,833		246,908		361,710		398,945	
Bales of 500 lbs. ..	895,707		1,067,521		1,326,748		1,111,086		1,627,695		1,795,252	
Cotton yarns, 000 lbs. ..	1,820		1,282		407		737		758		506	
Cotton fabrics, 000 sq. yds.	114,605		104,565		88,769		85,154		40,789		35,363	
Exports.												
Yarns and waste, tons ..	30,730		48,290		63,479		49,185		65,907		85,634	
Certain fabrics, 000 pieces	2,504		2,847		3,901		3,942		5,544		8,012	
Certain fabrics, 000 yards	77,749		104,001		124,931		124,251		156,660		203,679	
Federation estimate of spindleage at Aug. 31	1,637,000		1,731,587		1,948,000		2,131,494		2,191,960		2,300,000	

* Not separately stated.

valley of the Red River in the northern province of Tong King, and in the south along the valley of the River Mekong. The latter passes through the province of Cambodia, where the cotton of that name, which has recently proved so successful in Southern India, is also grown in considerable quantities, and it is said with success.

French Territory.

No complete figures are available of the acreage under cotton in the French provinces, nor any to guide us in an estimate of its future possibilities for cotton growing; but the export of raw cotton from Saigon alone in 1912 was returned as about 19,000 bales. The cotton is said to be of good quality and goes mostly to Hong Kong, from which the bulk of it is re-exported to Japan. From Tongking and Annam a considerable quantity of cotton used to go to China via the port of Pakhoi, but this trade seems to have dwindled entirely since 1909. It is probably going now to Japan, judging from their Customs returns of imports on p. 59.

Through the port of Bangkok, a considerable quantity of short staple native cotton is exported from Siam, mostly to Japan. The cotton-growing area is in the valley of the Menam River, but no statistics at all are available as to the area under cotton or the possibilities of its extension. It is said, however, that about 5,000 bales were produced in 1913, and that the export is growing steadily. The industry is almost entirely in the hands of small cultivators, but the government runs a ginnery at Pitsanuloke, and supplies free seed, which is partly imported from Cambodia. About

Siam.

1,000 lbs. of seed cotton per acre is spoken of as the probable yield under fair conditions, so that the general methods of cultivation must be like those of China, rather than of India.

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CHAPTER VI

RUSSIA, PERSIA, AND ASIA MINOR

Russian consumption and production: Ancient cultivation: Chinese irrigation: Modern developments: American and native cottons: Turkestan and Trans-Caucasia: Soil and climate: Labour and land tenure: Statistics—Persia: The Caspian littoral and interior provinces—Asia Minor: Adana, Aïdin, and Aleppo—Greece, Malta and Cyprus.

Russian Mills.

THE importance of the Russian crop in the world's cotton supplies is not unlike that already described in the case of the Indian crop; it is relieving the pressure upon the American supply by providing the Russian mills, which are now very numerous, with a home-grown supply. Thus, since, say, 1900, though the consumption of cotton in Russia has increased by at least 50 per cent., the imports of foreign cotton have hardly gone up at all. The increase has been met by the native-grown supply, and the ambition of the government is to secure eventually a sufficient and exclusive supply of good cotton for the requirements of the Russian mills. The total amount of the crop has been stated by various authorities as round about a million bales (of 500 pounds); but, according to the International Federation Statistics for the year ending August 31, 1913, much more than this was consumed in the Russian mills.

Spindles and Consumption.

The figures show that 7,130,843 spindles (out of an estimated total of 9,212,557) consumed 1,481,778 bales of "sundries"—*i.e.*, cotton other than American, Indian, and Egyptian, and which must therefore be almost entirely Russian. The discrepancy is probably explained by the fact that many of the Russian bales weigh only about 270 to 290 pounds.

Domestic Consumption.

In Russia, again, we have the same statistical difficulty as in India and China, in the large quantity of cotton taken for domestic consumption, of which no statistics at all are available.

Ancient Cultivation.

Cotton seems to have been cultivated in Central Asia from ancient times; but only native varieties were grown and for domestic consumption, until after the American war. The native cotton is of a rough staple, about $\frac{9}{16}$ of an inch in length, and similar to the Indian cotton, to which it is probably related.

Indigenous Cotton.

It has the same botanical peculiarity as the Indian *Wagad* variety, in that the bolls do not open sufficiently to allow the cotton to be pulled out, so that in picking the crop the bolls require to be broken off, and the cotton extracted afterwards. This peculiarity is of considerable economic value, in that it protects the cotton from damage by rain or frost in autumn.

Introduction of American.

In Russia, as in India and Egypt, the cotton-famine caused by the American Civil War led to attempts to extend the cultivation of cotton and to introduce foreign varieties. Sea Island seed was the first tried, but proved unsuitable, as the climate is very dry; but later on further

trials were made with American Upland seed, which proved successful. It soon became acclimatized, and was generally adopted wherever possible, on account of its superior quality and higher yield

Protection.

The development of cotton growing in Russia has been greatly fostered by the high import duty of nearly 3d. per pound imposed upon imported cotton. As the Russian mills still consume at least half a million bales per annum of foreign cotton (chiefly American) the burden on the industry and on the consumers must be considerable. The corresponding advantage to the growers seems to show itself chiefly in high rents (as much as £6 per acre), and high rates of interest exacted by the money-lenders who finance the small growers; 5 to 12 per cent. *per month* is spoken of. These figures remind one forcibly of Egyptian conditions.

Rents and Usury.

Turkestan and Trans-Caucasia.

There are two chief areas in the Russian Empire devoted to cotton growing. The first is in Russian Turkestan, or that part of Central Asia which is bounded on the south and east by the northern spurs of the Himalayas, on the west by the Caspian Sea, and on the north by the 43rd parallel. The other is the district known as Trans-Caucasia, lying between the Black Sea and the Caspian Sea. These are the most northerly cotton-growing areas in the world, five degrees farther north than the limits of cotton growing in America, and much farther from the equator than any country at present growing cotton in the southern hemisphere.

The total extent of the possible cotton-growing districts

RUSSIAN COTTON CROP, BY PROVINCES, 1907-1913.

In Bales of 500 Pounds (000's omitted).

Provinces.		1907.	1908.	1909.	1910.	1911.	1912	1913.	Area in 1912. In Acres, 000's omitted. (3)
Caucasus •	(1)	—	86	86	90	80	124	—	—
	(2)	57	143	57	62	54	94	—	—
	(3)	59	35	43	46	63	67	—	223
	(4)	63	38	46	49	107	70	—	—
	(5)	—	56	—	—	—	112	116	—
Turkestan :									
Ferghana	(1)	—	332	455	480	540	510	—	—
	(2)	446	390	456	500	507	581	—	—
	(3)	260	230	272	490	287	395	—	661
	(5)	—	488	—	—	—	485	533	—
Tashkent	(1)	—	25	29	38	50	45	—	—
(Syr	(2)	54	29	24	43	36	84	—	—
Darya)	(3)	49	25	29	31	49	70	—	156
	(5)	—	37	—	—	—	70	86	—
Samarkand	(1)	—	22	29	37	30	22	—	—
	(2)	49	32	36	46	46	74	—	—
	(3)	22	20	17	22	41	39	—	79
	(5)	—	37	—	—	—	59	70	—
Transcaspia	(1)	—	51	54	62	59	66	—	—
	(2)	72	55	30	80	71	105	—	—
	(3)	37	36	33	61	58	60	—	109
	(5)	—	83	—	—	—	64	58	—
Totals	(1)	—	430	567	617	679	643	—	—
	(2)	620	506	546	669	660	844	—	—
	(3)	364	317	350	610	430	562	—	1,005
	(4)	386	494	372	642	586	596	—	
	(5)	—	645	—	—	—	672	753	1,228
Bokhara and Khiva:									
Bokhara	(1)	—	72	72	30	37	50	—	
	(5)	—	—	—	—	—	81	94	
Khiva ..	(1)	—	32	43	47	37	30	—	
	(5)	—	—	—	—	—	47	48	
Totals	(1)	—	104	115	77	74	80	—	No area statistics
	(5)	—	146	—	—	—	128	142	
	(2)	114	58	106	125	107	135	—	
and totals	(1)	—	620	768	784	833	847	—	
or others, see	(2)	791	705	709	856	821	1,073	—	
able A, III.)	(5)	620	846	785	981	939	917	1,004	

REFERENCES.

Shepperson's "Cotton Facts," 1913. (*This table discontinued in* 1914 *edition.*)
Jones' Handbook, 1913. (*This table discontinued in* 1914 *edition.*)
Recueil de données statistiques et économiques sur l'industrie agricole, 1914, published by ussian Government Department of Agriculture. The figures are given in poods (36 lbs.) of cotton ; here converted to bales of 500 lbs. lint at the rate of 42:1. The area figures are in atines = 2·7 acres.
Year-Book of the U.S.A. Department of Agriculture.
"Cotton Production," Annual Bulletin of the U.S.A. Census Bureau ; figures attributed to

in Turkestan is given as over 200,000 square miles, but, like Egypt, only a very small proportion of this area is at present cultivable—about 5,000,000 acres according to one estimate (Poniatovsky). Of the cultivable area, only about one-third could, under existing conditions, be utilized for cotton growing, and the actual area under cotton probably does not greatly exceed 1,250,000 acres.

Possible Area in Turkestan.

The yield, however, is comparatively high, being stated at not less than 300 pounds of lint per acre, while the best districts are said to give an average of about 450 pounds. These figures can only be excelled in Egypt, and, indeed, the most striking thing about the Russian crop in almost every respect is the similarity of the conditions to those prevailing in Egypt. Each produces about 1,000,000 bales per annum, and the differences between the two countries are fairly well represented by the different weights of the bales—720 pounds and 500 pounds respectively.

High Yield.

The climatic conditions of Turkestan and Trans-Caucasia are fairly similar, and a description of the conditions prevailing in the former may be taken as applying to both. The climate of Turkestan is continental, the rainfall ranging from about 6 inches per annum in the Syr Darya district to 16 inches in Samarkand. Evaporation is very heavy, owing to the great heat in summer, so much so that some of the lakes and rivers are gradually disappearing. Cotton growing, therefore, is only possible under irrigation, which is supplied by a number of rivers flowing from the mountains into the plains. Irrigation seems to have been intro-

Climate.

duced by the Chinese, in the first century of the Christian era, it is said; some of the old works are still in existence, and it is believed that they can be repaired or made the basis of new schemes. The government has plans in hand for extensive engineering works, which would nearly double the area at present available for cotton cultivation.

Irrigation.

This, however, would probably require a considerable increase in the labour supply, which is already scarce; but the deficiency might be supplied by encouraging immigration from other thickly populated parts of the Russian Empire. It must be remembered, however, that Turkestan only became Russian about fifty years ago, that it is very sparsely inhabited (about eight to the square mile on the average, and not more than twenty-five in the most populous provinces), by a mixture of almost every race of Central Asia, mostly Mohammedans. To them the Russians are an alien conquering race, like the English in Egypt, so that, if the analogy may be carried further, the proposed immigration is not likely to be without difficulties. Another necessary condition of the extension of cotton growing would be the development of communications with the distant wheat-growing areas of Russia, so as to provide the necessary food-supply for the increased population.

Labour Supply.

Native Population.

Besides the ancient irrigation works above referred to, the Chinese have left behind them a valuable legacy in many of their methods of careful and intensive cultivation, and even some of their tools are still in use. Those who know Egypt will

Chinese Methods.

recognize in the *kĕtmēn* a very marked resemblance to the "fass," or hoe, which serves every purpose there, and is supposed to be the oldest form of agricultural implement in the world.

Soil.

The soil in Turkestan is largely clayey, and is very suitable for irrigation works, as it is not easily permeable by water, and is very firm when moist; at the same time it is very rich, its fertility having been increased by alluvial deposits from the rivers.

Cotton Season.

The cotton season opens with planting in March or April; picking begins in August, and ends with the arrival of frost about October. With a summer of such short duration early maturing varieties of cotton are essential.

Small Holdings.

The land is mostly in the hands of small farmers, who own or hire it under various systems of profit-sharing. They are described as almost ideal agricultural labourers, though greatly handicapped by their economic dependence, especially through lack of capital.

Machinery and Wages.

Hand labour is employed almost entirely, the use of agricultural machinery being very limited, and wages are very high—as much as 5s. per day, it is said—having risen 100 per cent. during the last decade.

Cultivation.

The fields are laid out in ridges and furrows, the latter being connected in zigzag fashion to carry the irrigation water over the whole area. The seed is sown after watering (unlike Egypt), and twenty to thirty seeds are put in each hole, to enable them to break through the hard soil. On thinning out, three plants are left in each hole. Four or five waterings are given each summer. If

too much water is given, the soil becomes hard, and interferes with the proper growth of the plant. Another peculiar method of planting is described. The cotton is sown in "flat ridges," with parallel furrows only. After the plant is well up, new transverse furrows are cut, so that each plant now becomes the centre of a small island surrounded by the irrigation water at every flooding. A similar method has been known in Egypt to protect wide-sown plants from damage by wind by heaping up the soil round the young plants.

Hot Winds.

The most unsatisfactory feature of the climatic conditions as regards cotton growing is the constant danger of severe hot winds from the north-east and north, known as "garmsil," which sweep over the deserts in summer, and apparently destroy the plant by drying it up. At the same time they damage the ripe cotton by blowing dust and trash into the boll. They seem to be most frequent in very dry seasons, and it is said that they may be responsible for the loss of as much as one-half or one-third of the crop in a bad season.

Ginning and Baling.

The cotton is ginned and pressed at local ginneries into bales of about 250 pounds, with a density of about 24 pounds; but most ginners are now putting up bales of 500 pounds, with a density of over 30 pounds. The ginning out-turn seems to be low on the whole, about 28 to 30 per cent.

The different subdivisions of the cotton area are as follows:

In Turkestan there are five chief administrative divisions, of which four are important cotton-growing centres, besides the two tributary states of Bokhara and Khiva.

1. Ferghana is a long valley bordered on three sides by high mountains, and is approachable only on the west by a narrow pass. The climate is very hot in summer and mild in winter. The country is irrigated by canals from the Syr Darya River, which rises in the Tian Shan Mountains, east of Ferghana, and other smaller rivers. The province produces about one-half of the whole Russian crop, entirely of the American type; it is described as having an excellent white colour, with a strong silky staple of about $1\frac{1}{8}$ inches in length, and is adapted for use in twist yarns. It ranges between "fully middling" and "good middling." The area at present under cotton is about 700,000 acres, with a yield of between 400,000 and 500,000 bales of 500 pounds, but there are large areas which could be put under cultivation if irrigation were available.

Ferghana.

2. Next to Ferghana is the Syr Darya district, situated on the river of that name, from which it is irrigated; it lies to the north-west of Ferghana, and occupies the lower reaches of the river, which finds its way into the Sea of Aral near its northern end. Its acreage is about 150,000, with a yield of about 80,000 bales. Tashkent is the chief town of the province.

Syr Darya.

3. The Samarkand district is irrigated from the Serafschan River, a tributary* of the Amu Darya (the classical Oxus), which also finds its way into the Sea of Aral at its southern end, forming an enormous delta. The extension of cotton cultivation in this district is limited by the variety of other crops

Samarkand.

* According to other maps the Serafschan never reaches the Amu Darya, but is lost in the desert.

open to the cultivator, and also by the fact that great damage is done to cotton by locusts, which can be avoided in the case of other crops, such as rice, by flooding the land. It comes considerably behind Syr Darya in acreage and yield.

The type of cotton grown is chiefly American, but its quality has been lowered by mixing with the native type, which is often grown alongside.

Trans-Caspian.

4. The Trans-Caspian district obtains its water-supply from the Amu Darya and Murgab Rivers, the latter being one of those mysterious rivers of Central Asia which never reach the sea. Flowing northwards from the mountains of Afghanistan, it seems to disappear into the desert a little north of Merv. On the Murgab River are situated the Imperial estates, which are magnificently laid out, and produce very fine cotton; but elsewhere the quality of the crop has suffered seriously by mixing with the native variety. In area and yield it is probably above Samarkand, but a long way behind Ferghana.

Bokhara.

Besides these districts cotton is also grown in the two tributary states of Bokhara and Khiva. In the former, which lies between Samarkand and Trans-Caspia, and is watered by the Serafschan and Amu Darya Rivers, only the native cotton is used, for a very peculiar reason. The land tax is charged according to the yield of the crop, and the latter cannot be removed from the field until the revenue officer has visited it, and assessed the value of the cotton. The native variety, with its closed bolls, is the only type which can resist damage by weather during this delay. If this

restriction were removed it is believed that the state possesses great possibilities for growing cotton of the improved types. Its present output is probably something over 75,000 bales.

Khiva.

Khiva lies north-west of Bokhara and on the lower reaches of the Amu Darya. It produces very good American cotton, which is said to be both longer and stronger even than the Ferghana type, and fetches higher prices in Moscow. The native cotton is also grown in this part, and the total yield is nearly 50,000 bales.

Railways.

The whole of Turkestan is comparatively well supplied with railway communications, which traverse it from end to end. Starting from Krasnovodsk, on the eastern shore of the Caspian Sea (opposite the great oil centre of Baku), the line runs south-eastwards through the southern portion of the Trans-Caspian province, and passes through Askhabad to Merv; from this point a branch runs due south to the Russian border, near Herat, in Afghanistan. This line may in course of time be expected to run through to India. From Merv the line turns northwards again across the Kara Kum Desert, and, crossing the Amu Darya River, it follows the course of the Serafschan River through Bokhara, and thence into Samarkand. After crossing the mountains, the line divides; one branch turns northwards through Tashkent, following the Syr Darya River, passes the north end of the Sea of Aral, and, still going north, finally joins the Trans-Siberian line at Samara on the Volga, thus linking up the Turkestan railways directly with the main Russian system. The other continues eastward, following the Syr Darya

towards its source through Ferghana, passing the chief cotton centre of the province at Kokhand, and terminating in the meantime at Andijan.

The other great cotton-growing district in Russia, namely, Trans-Caucasia, nominally forms part of Russia in Europe, but is generally similar in respect of climate and other conditions to the Asiatic provinces already described in Turkestan, except that the rainfall is heavier. The cotton-growing areas of the province lie to the south of the great Caucasian range in the valleys of several rivers, which flow east to the Caspian or west to the Black Sea. These valleys form only a small proportion of the area of the province, for to the south the country again becomes mountainous, rising to the slopes of Mount Ararat, and cotton is now being grown in the Valley of Erivan, within sight of the traditional landing-place of the Ark.*

Trans-Caucasia.

The larger area, however, is in the valley of the River Kura, which rises near Kars, passes through Tiflis, and finally falls into the Caspian Sea near Baku. Another considerable area is in the province of Kutais, on the River Rion, which runs westward, and falls into the Black Sea at Poti, a little north of Batum.

Cotton-Growing Areas.

These areas are also comparatively well supplied with railways. The main southern line from Moscow to the Sea of Asov at Rostov is continued southwards to the foot of the Caucasus Range at Vladikavkas, from which a project has long been under discussion to carry it across the mountains to Tiflis. In

Railways.

* For cotton growing in the Garden of Eden, see p. 81.

the meantime the line turns eastward to the Caspian shore, which it follows to Baku. From this another line strikes westward up the Kura River valley through Elizavetpol, Tiflis, and Kutais, to Poti and Batoum on the Black Sea. From Tiflis another branch runs southwards to Kars and Erivan.

Crop Figures.

The total area under cotton cultivation in the province in 1912 was given by a Consular Report * as 323,000 acres, but this, it was said, could be increased to over 1,000,000 acres if irrigation works were available. The yield of the crop was given as 125,000 bales, but it is understood that this could be increased to nearly 500,000 bales. The American as well as the native varieties of cotton are now grown, often side by side, with the inevitable result of the deterioration of the superior variety. To encourage cotton growing in the

Possibilities.

province the Russian Government took the matter up in 1912, and a congress of cotton growers was convened at Tiflis by the Caucasian Cotton Association towards the latter part of the year, which proposed the introduction of a series of measures for improving existing conditions. These embrace a scheme for utilizing the surplus waters of the Rivers Aras and Kura for the purpose of irrigating the fertile plain which lies between them, the substitution of cotton for certain summer cereal crops, the introduction of a wider system of credits to cotton planters, with a view to improving their methods in cotton growing and giving them practical instruction in its culture, and the establishment of experimental cotton farms.

* Batoum, 1912, No. 5,078; but *cf.* table on p. 67.

The statistical position of the Russian crop is very unsatisfactory. The table on p. 67 contains statistics from several different sources which do not agree at all in details, though on the whole they do not differ seriously as to the general result.

Statistics.

PERSIA.

Scattered over a number of small areas throughout the northern half of Persia there is a very considerable amount of cotton growing, which is now responsible for a crop amounting in the aggregate to over 140,000 bales. The cotton is generally of an inferior native type, similar to the indigenous Russian cotton, and, being of the type of boll which opens badly, the lint contains a great deal of leaf or trash. Although experiments have been made with the introduction of Egyptian and American varieties, the results seem to have been rather mixed, and nothing has been done to develop the growing of improved types on a commercial scale. The rainfall in the interior is only about 5 inches per annum, and there are no irrigation facilities except private wells. Yet in the immediate proximity of the rivers even rice is grown, sometimes to the detriment of the cotton-growing area, for rice requires an almost unlimited supply of water.

Native Type.

No Irrigation.

The crop is almost entirely exported to Russia, though a little probably goes overland to India still from the more southern districts of the interior. The cotton grown in the provinces of Gilan, Mazanderan, and Astarabad along the Caspian littoral is said to be better than that from the interior districts, such as Kasbin, Ispahan, Yezd, and Khorassan

Cotton Districts.

PERSIAN COTTON EXPORT STATISTICS.

From—	1908–09.		1909–10.		1910–11.		1911–12.		1912–13.	
	Bales.*	Value.	Bales.	Value.	Bales.	Value.	Bales.	Value.	Bales.	Value.
Gilan and Tunekabun	16,714	£169,436	32,918	£363,909	37,500	£374,995	—	—	—	—
Mazanderan ..	22,060	£259,358	32,892	£441,329	20,760	£347,790	—	—	—	—
Astarabad	15,402	£191,324	20,710	£273,911	21,696	£334,272	—	—	—	—
Totals ..	54,176	£600,118	86,520	£1,089,149	79,956	£1,057,057	—	—	—	—
All Persia	*76,000*	£847,550	*111,000*	£1,400,272	*107,000*	£1,407,608	—	£1,479,278	—	£1,706,246
Of which Russia took	—	£803,265	—	£1,363,576	—	£1,386,288	—	£1,452,749	—	£1,683,009
Percentage of total	—	95	—	97	—	98	—	98	—	98
Jones Handbook estimate of total crop†	80,000	—	114,000	—	114,000	—	128,000	—	140,000	—

* Bales of 500 pounds. † For others see Table A, III.

The figures in italics are estimated from the values.

In many districts, such as Kermanshah, hardly enough is grown for local domestic consumption. In Hamadan, near Teheran, there has been talk of erecting a cotton-mill.

Practically the whole of the commercial crop passes through the ports of Enzeli, near Resht, in the province of Gilan; Meshedisar, which serves Barfrush, the chief town of the province of Mazanderan; and Bender Gez in Astarabad; and the statistics on the opposite page are taken chiefly from Consular Reports on these districts. The cotton is brought down from the interior to these ports in small bales of about 230 to 270 pounds. How much of the cotton exported from these points is locally grown, and how much comes from the interior, it is quite impossible to say, nor is any information available as to the area under cotton in each district, nor the possibilities of extension. In the present disturbed condition of Persia any material increase is not to be expected unless perhaps in the more settled regions near the Caspian. Elsewhere transport is so unsafe and costly that the economic development of the country is practically suspended. In 1911-12, for example, it was reported that only about half the crop grown in Ispahan had been bought by the merchants and exported to Russia, while in Yezd many of the merchants, owing to the cost of transport, were unable to export what they had bought.

Export to Russia.

Increase Improbable.

Asia Minor.

The work of the German Levantine Cotton Company in Asia Minor falls to be mentioned here, as the conditions are probably more comparable to those of Russia than

any other country. The company was registered in 1904, and differs from other European schemes for the development of cotton culture in being a commercial venture, which pays a dividend and claims no government assistance. It has, however, adopted a commendable attitude in respect that it does not confine its efforts to schemes which would benefit the company itself, rather than the development of the industry at large. Thus the purchase of estates for the purpose of running plantations on the company's account has from the first been excluded from its objects. The methods employed have been directed towards the development of cotton growing in the districts selected, by the importation and distribution of good seed, by erecting gins and presses, and by financial subsidies to small farmers, who adopt suitable methods of cultivation.

The German Company.

The work of the company was first begun in the vilayet (province) of Adana, which occupies the north-east corner of the Levant, near Cyprus. This district was chosen because the conditions of climate and soil seemed most suitable for cotton growing, and also because the port of Mersina with the railway running through the town of Adana provided the necessary means of communication for the transport of the crop. The vilayet of Adana contains an area of about 15,000 square miles, with a population of about 425,000. Its most valuable part is the Cilician Plain, which contains about 750,000 acres of cultivable land. Besides this plain there is said to be in the province of Adana a further acreage of at least five times as much available for cultivation. This area lies in the lower regions of the Taurus Mountains to the north.

Adana.

Again, to the east and south-east of Adana lies the great area of Mesopotamia, the original Garden of Eden, the possibilities of which for cotton growing are supposed to be almost unlimited; but so much remains to be done to rescue the country from its present derelict condition that it can hardly be taken into account in the meantime. In 1910 Sir William Willcocks, of Egyptian irrigation fame, was employed by the Turkish Government to prepare a scheme for the reconstruction of the irrigation works on the Tigris and Euphrates, and the first instalment of the scheme was completed in the autumn of 1913.

Mesopotamia.

The geographical character of the province of Adana is said to resemble closely that of the Nile Valley. The soil is mostly alluvial, having been brought down by the rivers running through the plain, which, when swollen by the melting of the snows in the mountains, cause extensive inundations, and frequent alterations of the beds of the rivers. It is apparently beyond doubt that the full development of the country will be dependent on the provision of a complete system of canal irrigation; but, in the meantime, any large expenditure on such schemes would be premature and probably unprofitable, owing to the lack of population. This has been still further aggravated by the renewed massacres of Christians, especially the Armenians, who are the best cotton growers, in 1909, after the revolution in Turkey. This outbreak again decimated the adult male population, and practically destroyed the prospects of the crop for that year, as well as giving a severe setback to the progress of

Conditions in Adana.

Labour.

cotton growing for some years to come. Meantime, therefore, a moderate amount of regulation of the water-supply already available is sufficient for the irrigation of as much land as the present population could efficiently cultivate.

The climate of the Cilician Plain is said to resemble that of Lower Egypt, but with a much heavier rainfall—about 25 inches at Adana—mostly between November and May. The soil, however, is of a clayey character, and retains moisture for a long time. Considerable damage is sometimes done by hot winds in early autumn, causing boll-shedding.

Climate.

The general policy of the Company has been to develop small holdings, as the labour difficulty makes it practically impossible to run large plantations under European control. The native day labourers have a peculiar habit of changing their job every week, and the greater part of each Monday is spent in going to the market town to seek employment, though in many cases the labourer returns to his old employer. Here, as elsewhere, it has been proved that the native works much better on his own land than as a wage-paid servant. The chief difficulty of small holdings, however, is the lack of capital, and the company has done a great deal to assist in this direction.

Small Holdings.

The native type of cotton known as "Yerli" seems to be similar to that already described in Russian Turkestan, of which the chief characteristic is that the bolls are picked bodily from the plant and cleaned out afterwards at leisure. Not without reason, perhaps, under the existing conditions of lack of labour, the natives are very averse to abandoning this type. The

Native Cotton.

whole crop matures at once, and can be picked quickly, while the labour of removing the lint from the bolls, which takes time, can be done at leisure afterwards. American cotton, on the other hand, which the Company has made great efforts to introduce, matures gradually, and the actual operation of picking requires more labour in the fields. Again, the natives had been prejudiced against American cotton by the fraudulent practices of certain people who some years before had sold them American seed, which turned out to be absolutely worthless. Against these prejudices the Company has been steadily pressing on the introduction of American cotton, which is not only of much better staple than the native variety, but in the long-run pays better all round; but though their efforts are now meeting with considerable success, the native variety still greatly predominates. The native is hard to convince, though when once he is converted he is very quick to follow the line of greatest profit; but the labour difficulty still blocks the way. Experiments made with Ferghana seed from Russia have also given good results, and, generally speaking, Adana cottons, both of the American and Russian type, have realized prices fully equal to "Middling American." The cotton has a staple of fully an inch, and is described as very white and glossy.

American.

Russian.

The development of the crop has been hindered by all the difficulties which are familiar in other countries, where similar pioneer work is being done, especially with regard to the education of the cultivators in modern methods, the introduction of proper marketing facilities, and the establishment of proper methods of ginning and

baling the crop. On the latter point, it is interesting to note that the company has all along employed the Egyptian roller gin, instead of the American saw gin, with good results; and the style of bale adopted has also been in many respects similar to the Egyptian, though of only about half the weight.

Ginning and Baling.

While most has been done in Adana, progress has also been made in the province of Aïdin, near Smyrna, where unfavourable results with the vine crops in the upper parts of the valley have led many of the growers to abandon vine-growing in favour of cotton. The development, however, is still rather behind the point reached in Adana. It is said that good Egyptian cotton could be grown here, and that much irrigable land is available.

Aïdin.

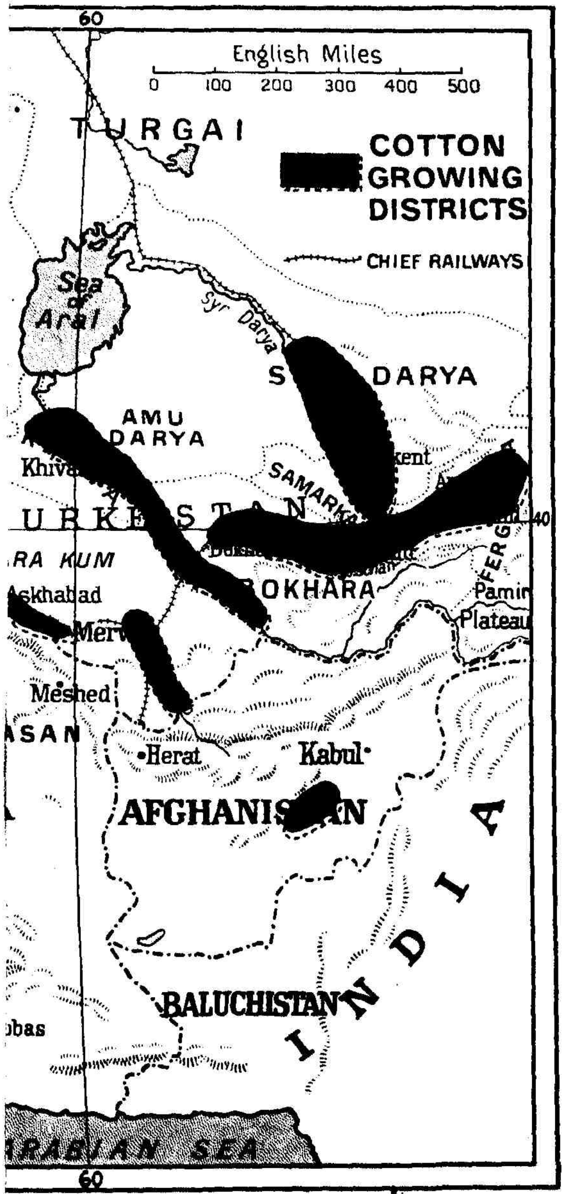
In the district round Aleppo, a few miles south of Adana, there is also a certain amount of cotton grown; but matters have not advanced very far, and the growers have been greatly discouraged at times by the destruction of the crop by locusts.

Aleppo.

The following are the latest statistics available with regard to the production of cotton in Asia Minor (in bales of about 440 pounds). About 10 per cent. of the crop goes to Salonika and other adjacent ports, for use in the mills there; but Austria, Italy, Spain, Germany, and France take the bulk of the exports, Austria alone taking more than half. There are also two weaving and spinning factories at Adana, and two at Tarsus which use about a third of the whole crop.

Statistics.

MINOR.



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In Greece, on the other hand, substantial progress has been made in cotton cultivation in the plains of Boeotia, chiefly under irrigation, and the average crop is stated at over 22,000 bales (of 500 pounds), all of which is used in local mills. In 1912 there were 2,400 acres under Egyptian cotton, and some has been grown even without irrigation. In Salonika there is a considerable amount of cotton grown; the crop in 1911 was 5,000 bales (of 500 pounds) of American, and 2,240 bales of native cotton.

Greece.

In Italy, too, there is a small quantity of cotton grown in the extreme south. Spain in 1906 inaugurated an attempt to revive cotton in its original European home, but nothing further has been heard of it.

Malta produces about 500 bales of cotton, and the crop seems to be increasing, but the maximum area available is very limited, and the quality of the product is such that it cannot compete with other crops, for which the local demand is great.

Cyprus has within the last few years increased her crop from 1,000 bales to about 7,000, and could apparently produce cotton of good quality—*e.g.*, long staple American, if irrigation were available. Otherwise the native type is very short. The better qualities are exported, chiefly to Marseilles and Trieste.

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CHAPTER VII

THE UNITED STATES, MEXICO, ETC.

Area and divisions of the Belt: Climate: Varieties: Growing methods: Future extension: Boll weevil: Labour-supply and cost of production: Improved yield and quality: Market conditions: Ginning and baling, defects and remedies—Mexico: Enormous area and great possibilities—Central America, Nicaragua and Honduras.

Predominance of American Crop.

As will be seen from Table A, I., of the world's cotton crops in the Appendix, the American crop still supplies more than half of the whole world's cotton consumption, and the basis price of American Middling exercises a controlling influence on the prices of all the varieties of cotton throughout the world.

The area of the American Cotton Belt is enormous, about 700,000 square miles, as compared with the total area of the United Kingdom, 121,400 square miles. It extends into eighteen out of the forty-nine states of the Union, but of these only ten states produce more than 100,000 bales. Of the total area of the Belt, considerably less than one-tenth part is under cotton cultivation, the final figures for 1913 being 37,089,000 acres out of about 450 millions. The allocation of the cotton acreage among the chief cotton-producing states is shown by the following table:

AMERICAN ACREAGE AND PRODUCTION BY STATES, 1911-1913.

From "Cotton Production," 1912 *and* 1913.

State.	Acreage.			Crop.*			Yield per Acre.			Percentage of Total Crop.		
	1911.	1912.	1913.	1911.	1912.	1913.	1911.	1912.	1913.	1911.	1912.	1913.
Texas	10,943	11,338	12,597	4,297	4,889	3,949	0·39	0·43	0·31	26·7	34·7	27·0
Georgia	5,504	5,335	5,318	2,875	1,889	2,457	0·52	0·35	0·46	17·8	13·4	16·8
Alabama ..	4,017	3,730	3,760	1,736	1,367	1,538	0·43	0·37	0·41	10·8	9·7	10·6
South Carolina ..	2,800	2,695	2,790	1,729	1,260	1,465	0·62	0·46	0·52	10·7	8·9	10·0
Mississippi ..	3,340	2,889	3,067	1,216	1,050	1,313	0·36	0·36	0·43	7·5	7·5	9·0
Arkansas ..	2,363	1,991	2,502	940	805	1,079	0·40	0·40	0·43	5·8	5·7	7·4
Oklahoma ..	3,050	2,665	3,009	1,056	1,057	881	0·35	0·39	0·29	6·6	7·5	6·0
North Carolina ..	1,624	1,545	1,576	1,156	935	873	0·71	0·60	0·55	7·2	6·6	6·0
Louisiana ..	1,075	929	1,244	399	393	459	0·37	0·42	0·37	2·5	2·8	3·1
Tennessee ..	837	783	865	459	290	401	0·55	0·37	0·46	2·9	2·1	2·7
Florida	308	224	188	96	60	69	0·31	0·27	0·37	0·6	0·4	0·5
Others†	184	159	173	150	96	130	0·82	0·60	0·75	0·9	0·7	0·9
Totals ..	36,045	34,283	37,089	16,109	14,091	14,614	0·45	0·41	0·39	100	100	100

* Running bales, round bales counted as half; linters included.
† Virginia, Kentucky, Missouri, Kansas, New Mexico, Arizona, and California.

The Belt may be divided into three main areas. The Eastern or Atlantic States, including North and South Carolina, Georgia, and Florida,* are served by the ports of Norfolk (Virginia), Wilmington (North Carolina), Charleston, the centre of the Sea Island crop, in South Carolina; Savannah and Brunswick, in Georgia; and Jacksonville in Florida. These states produce at once the best and the worst varieties of American cotton, for the Upland cotton grown in the landward parts of Georgia and the Carolinas stands at the opposite end of the scale from the Sea Island grown at Charleston. The Gulf States, viz., Alabama, Mississippi, Louisiana, and Texas, provide together more than one-third of the American cotton crop; of this, however, by far the largest share is contributed by Texas, which produced nearly 5,000,000 bales in 1912. The Gulf ports are Pensacola (in Florida), Mobile, New Orleans, and Galveston. New Orleans, which was formerly surrounded by large cotton-growing areas, and which gave its name to a particular type of Upland cotton, is still an important trading centre, although now, owing to the depredations of the boll weevil, there is hardly a cotton-field within a day's ride of the city. It still retains, however, the distinction of possessing the only cotton-futures market outside New York, and practically the whole trade of the Central or Mississippi States passes

Divisions of the Belt.

Atlantic States.

Gulf States.

New Orleans.

* Geographically, Florida should be included with the Gulf States, as its cotton area does not touch the Atlantic coast, but the greater part (in value) of its crop is Sea Island cotton, and is therefore more conveniently classed with Georgia and South Carolina.

through New Orleans for export purposes. The quantity of its exports, however, has been completely surpassed by Galveston, through which the great bulk of the Texas crop naturally passes.

Texas.

Texas, indeed, and its neighbours, New Mexico, Oklahoma, and the western portion of Arkansas, deserve to be classed as a section of the Belt by themselves, for the advent of the boll weevil has produced a redistribution of the cotton area. In the old days Louisiana and the southern parts of Mississippi and Alabama showed the densest production on the cotton map, but these districts are now relatively of little importance. The bulk of the cotton has moved westwards into Texas, while the finer qualities have moved northwards into the Central States,

Central or Mississippi States.

the riverain portions of the states of Arkansas, Mississippi, and Tennessee. The most valuable of all is what is loosely known as the Delta, which, however, is not the Mississippi delta, but a large triangular area of deltaic formation lying between the Mississippi and the Yazoo rivers, the latter joining the former at Vicksburg about 240 miles above New Orleans.

In addition to these main divisions of the Belt, there are two districts, of which the total area is as yet very small, but which promise great developments in the future. These are the irrigated districts of the Salt River valley in Arizona and the Imperial valley in California.

Throughout this enormous area the climatic conditions, as might be expected, vary considerably. The whole of

the American crop, however, is what would be called in Egypt a "rain crop." With the exception of Arizona and California, and occasional small areas elsewhere, there is no cotton grown under irrigation in the United States. The chief variation in the climate of different districts is in respect of rainfall. On the Atlantic sea-board the rainfall is heavy, and the atmosphere, especially near the coast, is always very humid. The ridges in the fields are designed in curves, to prevent a straight rush of water sweeping everything away. In the Central States, again, the rainfall is less, but the river and its various tributaries provide ample moisture, frequently causing disastrous floods, in spite of the elaborate system of levees or banks along the Mississippi. In Texas, however, the greater part of the cotton area is a considerable distance from the sea. While the rainfall is as a rule sufficient (about 30 inches per annum), and sometimes even excessive, especially in spring and autumn, certain parts of the state are liable to occasional severe drought, which may seriously reduce the yield of a year's crop.

Climate.

Rainfall.

The American climate, however, while it renders irrigation unnecessary, has its own drawbacks, which lie chiefly in its great extremes and its uncertainty. In Texas a considerable rainfall is required in winter to put what is called a good "season" into the ground—*i.e.*, to provide a good supply of moisture in the ground against the summer scarcity. The spring rains which are necessary for planting in all states may, if excessive, have the effect of hardening the surface so that the seedlings cannot break through, and so necessitate resowing. In the

Central States an abnormal rise of the Mississippi may flood large areas of valuable cotton land, and destroy the crop completely for the year. Again, in summer the crop is entirely at the mercy of the weather, too much precipitation being as harmful and about as likely in certain districts as the opposite extreme of drought in others. Fine weather in autumn is essential to the proper maturing of the crop, and even during the picking season it is still liable to serious damage by heavy rains; for the American plant in most cases is low-growing, and the rain beating on the soil throws up mud, which produces tinged or stained cotton. As, owing to the labour difficulty, the picking season is very long drawn out, a large proportion of the crop may thus suffer deterioration in value.

Floods.

Picking Weather.

Finally, the ultimate out-turn of the crop depends chiefly on the date of the first killing frost, which checks growth and settles the fate of the "top crop" or late maturing bolls on the upper branches of the plant. The winter frosts, however, serve a beneficent purpose in another way by destroying the boll weevil.

Frost.

The distribution of the different varieties throughout the Belt has already been indicated. The best Sea Island, the real "Islands" cotton, is grown in a very small area, consisting of a number of islands lying off the coast of South Carolina opposite Charleston. Next to this come Florida and Georgia cotton, grown from Island seed in certain portions of South Carolina and Georgia near the coast, and in Florida. Long

Varieties.

staple Upland cotton, the best of which is little below the second grade Sea Islands in length of staple, is grown in the Yazoo delta and in a number of smaller areas scattered throughout the Belt. The great bulk of the crop, however, consists of the ordinary Upland cotton, which is spread over the whole Belt, and supplies the raw material for the "bread-and-cheese" trade of the cotton industry, especially in the American mills and in Lancashire.

Cultivation.

The methods of growing and handling the crop vary considerably in different districts, but the following description may be taken as applying generally to the ordinary Upland crop throughout the Belt. The dates of sowing and picking are naturally the most variable factors, but, generally speaking, sowing begins as soon as possible after the danger of frosts is safely past. This means as early as the end of February or beginning of March in South Texas, and as late as the third week in May in the high-lying parts of the Atlantic States. Preparation of the ground is done in spring rather than in the preceding autumn. Deep ploughing is very little practised, owing to lack of labour, and in

Sowing.

many cases ploughing so called is confined to turning over the ridge of the previous year's crop into the adjoining furrow, so that the plants occupy alternate lines in successive years; for in many cases cotton is planted year after year in the same field. The distance between the rows is supposed to correspond roughly with the expected height of the plant—say, 4 to 6 feet—but the former distance is probably more common than the latter. For sowing, a simple machine is fre-

quently employed which sows 6 to 8 acres a day, not less than three-quarters of a bushel of seed being used per acre. "Chopping," or thinning out, begins about two to four weeks after sowing, when the plant is about 5 inches high, and a distance of 12 to 14 inches is left between the plants. "Cultivation" begins soon afterwards, and goes on at intervals of about three weeks until July or August. Its object is to remove weeds, especially grasses, for the cotton crop must be kept particularly free of weeds, and to keep the surface of the ground well broken so as to minimize evaporation. It is generally done by special machines, called "cultivators," which work along the rows between the plants, and hoeing between the plants is also found desirable. Cultivation is generally repeated about five times, if labour is available, until about the beginning of August, when the crop is finally "laid by," as it is called, to mature for the harvest.

Flowering.

Flowering begins about two months after sowing, when the plants are as a rule about 15 inches high. The flowers pass from pale yellow to pink or purple, and fall off on the third day. The earliest bolls begin to form about three months after sowing, and take from one to two months to ripen. The boll contains from three to five compartments, or locks; Upland generally has five—less means a weak plant—and Sea Island always three. One of the characteristics of Upland cotton is the way in which the boll, when ripe, opens wide and allows the cotton to protrude freely, so that the whole contents can be picked easily in one handful. The flowering and fruiting periods of the cotton plant are long drawn out, so that they overlap considerably, and flowers and ripe

bolls are generally to be seen simultaneously on the same plant.

The date of commencing picking varies from the middle of July in South Texas to the end of September in the latest districts, and goes on practically throughout the winter, owing to the lack of labour to pick it as soon as it is ripe. There are generally at least three pickings, at intervals of about a month; but most planters pick simply whenever they can get labour and there is ripe cotton on the plants, which is practically all the time. Picking is everywhere performed by hand, the pickers creeping along, almost on all fours, between the rows, and throwing the cotton into a long bag slung over the back by a band round the neck. The bag is universal in Texas, but baskets used to be generally employed in the Eastern States. When these are full, the cotton is taken to the edge of the field and weighed, to ascertain the picker's wage. In Texas it is generally loaded straight into the waggon, and taken off to the ginnery at once; but in the Atlantic States it is frequently left lying in heaps at the side of the field for some days. In other districts it is stored for a time in small huts till enough is accumulated to make a bale (about 1,500 pounds of seed cotton). It is said that the cotton improves by being stored for, say, a month before ginning, as this not only allows it to dry thoroughly, but any unripe fibre grows slightly and absorbs the oil of the seed, so that the cotton acquires a more uniform staple, a stronger and more supple fibre, and a better colour. In Texas, however—at the beginning of the season, at least—the writer saw no evidence of

Picking.

Storing.

rendered any great development of the industry practically impossible. In 1793, however, the discovery by Eli Whitney of the saw gin quickly revolutionized the trade, and the introduction of slave labour during the same decade provided the necessary labour-supply for the extension of the crop. As will be seen from Table C, I., in the Appendix, the crop in 1794 was nearly three times that of 1792, and as the price in these days was very high (it averaged 44 cents per pound in 1798 and 1800), there was every inducement to extend the cultivation. One million bales was reached in 1826, two in 1839, three in 1851; and the crop of 1861, the last before the American Civil War, was 4,500,000 bales. The war, of course, reduced the crop almost to vanishing-point; is said to have fallen to 300,000 bales in 1864. The close of the war found the Southern States in a condition of economic decrepitude from which they have only recovered in recent years. The cotton crop, however, was of the highest importance, because of the quick return in cash obtainable for its harvest, and every effort was made to recover the ground lost. Thus in 1865 (taking the Liverpool figures now), the crop was only 2,314,000 bales, and it did not exceed 3,000,000 bales till 1869. In the following year, however, over 4,000,000 bales was attained, followed by a new record of five millions in 1878, six in 1880, seven in 1887, eight in 1890, and nine in 1891. Since then the record crops have jumped two or three millions at a time—namely, to 11,000,000 bales in 1898, 13,000,000 in 1894, and the present record of 16,043,000 bales in 1911.

The Saw Gin.

The War.

And After.

Coming down to recent history, the table on p. 100 gives a summary of the available statistics of the area and yield of the crop, and the effect of the latter on its price. It is possible, however, to bring out the results of these statistics in a much more telling way by representing their movements in a diagram. Thus, by setting down the area and the crop on parallel lines, as is done in the diagram on p. 101, it will be seen that the total yield of the crop from year to year corresponds to the area under cultivation, but with certain marked discrepancies in particular years, especially 1889, 1895, 1903, and 1909, when the crop was very much smaller than it should have been in view of the acreage. On referring again to the table, this is confirmed by the figure of the average yield per acre for these years, which was much below the normal. On the other hand, the crop in 1891, 1897, 1898, 1904, and 1911, was better than normal, resulting in a widening out of the distance between the area and crop lines on the diagram.

Area Yield and Prices.

Area and Crop.

Attention may be specially called to the light which these figures throw upon the belief, which a few years ago was quite commonly held in Lancashire cotton circles, that the course of the American cotton crop was always up and down, a big crop being generally followed by a small crop, and so on. The actual yield of the crop from 1903 to 1910 certainly did seem to follow such a rule, but on examining the statistics of area and average yield in the table, it will be seen that this was due mainly to climatic conditions, and may therefore be described as accidental.

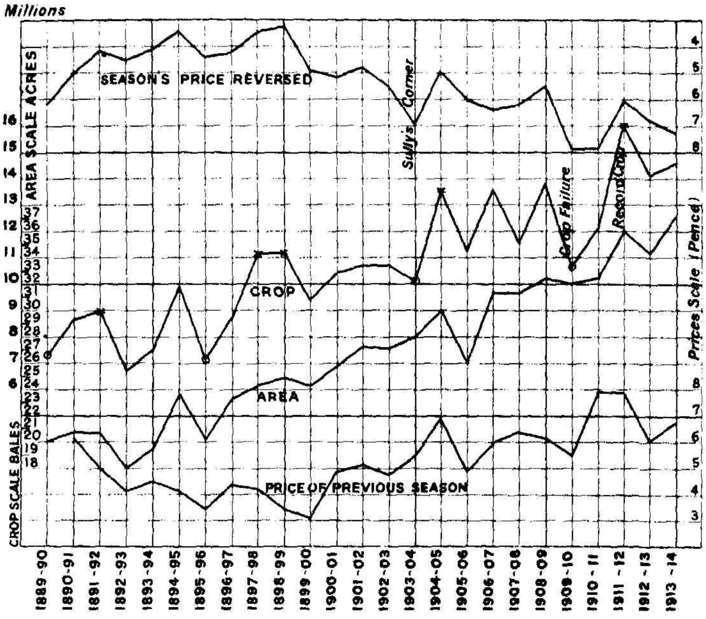
AMERICAN COTTON CROP STATISTICS, 1889-1914.

Founded on "Cotton Production" and Turner Routledge's "Cotton Diagram."

Season.	Acreage. Census Bureau Figures.	Crop. "Chronicle's" Figures.	Yield per Acre	Average Price of Middling.
				Pence per lb.
1889-1890 ..	20,175,270	7,313,726	0·36	6·19
1890-1891 ..	20,509,853	8,655,518	0·42	5·00
1891-1892 ..	20,714,937	9,038,707	0·44	4·12
1892-1893 ..	18,067,924	6,717,142	0·37	4·61
1893-1894 ..	19,525,000	7,527,211	0·39	4·19
1894-1895 ..	23,687,950	9,892,766	0·42	3·44
1895-1896 ..	20,184,808	7,162,473	0·35	4·38
1896-1897 ..	23,273,209	8,714,011	0·37	4·22
1897-1898 ..	24,319,584	11,180,960	0·46	3·47
1898-1899 ..	24,967,295	11,235,383	0·45	3·28
1899-1900 ..	24,275,101	9,439,559	0·39	4·87
1900-1901 ..	25,758,139	10,425,141	0·41	5·16
1901-1902 ..	27,220,414	10,701,453	0·39	4·78
1902-1903 ..	27,114,103	10,758,326	0·39	5·46
1903-1904 ..	28,016,893	10,123,686	0·36	6·94
1904-1905 ..	30,053,739	13,556,841	0·45	4·91
1905-1906 ..	26,117,153	11,319,860	0·43	5·95
1906-1907 ..	31,374,000	13,550,760	0·43	6·38
1907-1908 ..	31,311,000	11,581,829	0·37	6·19
1908-1909 ..	32,444,000	13,828,846	0·43	5·50
1909-1910 ..	32,044,000	10,650,961	0·33	7·86
1910-1911 ..	32,403,000	12,132,332	0·37	7·84
1911-1912 ..	36,045,000	16,043,316	0·45	6·09
1912-1913 ..	34,283,000	14,128,902	0·41	6·76
1913-1914 ..	37,089,000	14,609,968	0·39	7·26
1914-1915 ..	*36,722,000*	*16,500,000*	*0·45*	(*Estimated*)
25 years' average	..	..	.. 0·40	5·39

The point which interests the consumer most is the movement of price and its causes. The question is whether there is any connection, or "correlation," as statisticians call it, between the amount of the crop of each year and the

Crop and Prices.



x = Good crop—*i.e.*, average yield above 0·43 bale per acre
o = Bad crop—*i.e.*, average yield below 0·37 bale per acre.

Note.—The degree of correlation between any pair of variables, such as area and crop, or crop and price in the above diagram can be expressed numerically by appropriate statistical methods. A perfect correlation is then represented by unity (1·0), while complete absence of any connection is signified by zero. In the above diagram the correlations thus measured between area and crop, and crop and price, would necessarily be high, because all three are on the whole rising throughout the period. In the case of area and crop this really represents the close relation of cause and effect—increased acreage *should* mean increased crop—but in the case of crop and price the reverse is the case; increasing crops should have caused the price to fall.

A much more severe test which obviates this objection can, however, be applied by correlating the deviations of each line from the average rise, the latter being represented by a straight line drawn through the zigzag line in the most probable average position. The author is indebted to Mr. W. Lawrence Balls for the following correlation values thus obtained:

Between area and crop	..	+ 0·58 (± 0·10)
,, crop and season's price	..	− 0·44 (± 0·12)
,, area and price of previous season	..	+ 0·43 (± 0·12)

price of cotton during the following season (September 1 to August 31). To bring this out, the line in the diagram representing prices must be reversed—that is to say, measured from the top downwards instead of from the base-line upwards—for an increase of the crop should naturally produce a lower price.

This is done in the diagram, and it will be seen at once that, again with certain exceptions, the price and the quantity of the crop are closely related. The exceptions are (1) the year 1906, when an increased crop fetched a higher average price than during the previous season; and (2) in 1910-11 a crop 2,000,000 bales above its predecessor failed to lower materially the average price for the season. Every cotton user knows the reasons for these exceptions. 1906-07 was the year when the increased demand for cotton goods of all kinds throughout the world produced a boom in the cotton industry which was only surpassed by that of 1912-13. In 1910-11, again, the cotton trade was still suffering from the after-effects of the terrible shortage due to the failure of both the American and Egyptian crops in 1909, and it took the huge crop of 16,000,000 bales in 1911 to wipe out that shortage.

From this diagram the general tendency of crops and prices is at once seen. The crop has, on the whole, been steadily increasing, but the price has risen a good deal faster than the crop increased. This is shown by the fact of the steady convergence of the two lines, which begin far apart and end close together. Only one explanation of this is possible: the demand has been increasing faster than the supply.

General Result.

All the efforts to increase the world's cotton supplies have not succeeded in keeping pace with the increase of consumption. It is this fact which gives its supreme importance to the next question—namely, Why has the area under cultivation in America not increased more rapidly than it has done?—for it is clear that, subject to fluctuations due to the vagaries of the American climate, the amount of the American crop depends mainly on the area sown.

Cause of Reduced Area.

On this point, then, the statistics have still something to tell us. What is the controlling factor in the area sown each season? Why, for example, was the area reduced so materially in 1892, 1895, 1905, and 1912? It requires little ingenuity to suggest a likely explanation. It is human nature to judge the future by the past, and the ordinary cultivator, in deciding how much land to put under cotton this year, is guided more by the price he got for his cotton last year than by any guess he may be able to make at the probable price for the coming season. To test this it is only necessary to plot out on the diagram alongside of the area sown in each year the average price of the *previous* season. The result is to bring out a very close correlation between the two sets of figures. This, for example, at once explains the reduced area of 1905. The average price during the season 1903-04 was the highest then recorded, owing to Sully's corner in the spring of 1904, but this was followed by a sharp reaction to lower prices in the autumn of 1904, which, again, was followed by a 13 per cent. reduction in the area sown in 1905. A similar explanation applies to 1892,

1895, and 1912; in each case the reduction of acreage followed a marked fall of price in the previous seasons.

But the study of past history is only of interest to the practical man if it helps him to forecast the future. Is it possible, then, to infer anything from these figures as to next year's crop and its price? The average price of 1912-13 was higher than that of the previous season, and the acreage in 1913 rose correspondingly. For a time it looked as if, owing to the drought in Texas, etc., the resulting crop was going to fall below the figure of the previous season, but that fear was soon dispelled, and a crop of 14,610,000 bales, or the second highest on record, was ultimately harvested. Yet the average price for the season touched a high level, viz., 7·26d., distinctly higher than the two previous seasons. We were therefore entitled to expect an increase of acreage in 1914, and, given ordinary luck in the season's weather, the crop of 1914 should exceed that of 1913.*

Recent Figures.

Prospects of 1914.

It still remains, however, to explain why the increase of area is relatively so slow. One would have expected that such a marked rise in price would have rendered cotton growing an exceedingly profitable enterprise, and that the effect would have been a more rapid increase in the area. The

Increase of Area slow.

* P.S.—This expectation at first seemed to be justified, the estimated area being 36,960,000 acres, against the original estimate of 35,622,000 for 1913. But the final report raised the figure for 1913 to 37,089,000 acres, while 1914 was reduced to 36,722,000, so that the latter now shows a definite reduction of acreage. Nevertheless the crop is certain to exceed that of 1913, and will probably establish a new record (see p. 368).

explanation is that there are several factors which have hitherto restricted the extension of the cotton area, and may do so even more seriously in the future.

Boll Weevil.

The first of these is the boll weevil, which was first found in Mexico in 1862, and made its appearance at Brownsville, Texas, on the Rio Grande River, in 1892. Since then it has steadily spread over the Cotton Belt until, in 1913, an area of 296,300 square miles out of the total of 700,000 was seriously infected. In the South many districts, especially near the Gulf coast-line, have been almost entirely denuded of cotton; in the Central States it practically wiped out the long staple crop, and its irresistible approach to the Eastern States threatens a like fate to the Sea Island crop. The advance of the pest is shown on the map at p. 132.

This most destructive of the world's cotton pests, known as *Anthonomus grandis*, is an insignificant-looking, brownish-grey weevil about a quarter of an inch in length, and just like any other small beetle in appearance. It attacks the squares or bolls, upon which it lives, while the female bores a tiny hole in the small, newly formed boll, and lays an egg in the hole. The immediate effect is to stop the growth of the young boll, while the squares attacked die and fall off; the ultimate effect is the production of another healthy boll weevil, which proceeds to repeat the process, and if it succeeds in finding sufficiently snug quarters in which to pass the winter and defy the frost, will come forth again in the spring to do further damage. There are supposed to be four or five generations in the course of the season, from May to December.

The weevil is at the height of its work in early autumn,

and as it does not often attack, or at least does little harm to any boll which is fairly well matured, an early plant may save the greater part of its yield; but the later maturing bolls, which constitute the top crop, and which with a late frost may make all the difference between a profitable crop and a comparative failure, are its special victims.

Remedies.

It goes without saying that every effort has been made to discover some cure for this pest, which is costing America many millions of dollars per annum, and seriously restricting the increase of the American cotton crop. So far these efforts have met with very little success, nor is there any immediate prospect of the discovery of any real cure. Meantime, all that can be done is to attack its hibernating quarters by removing, wherever possible, all brushwood or undergrowth from the neighbourhood of the cotton-fields. This, however, in a land of almost tropical vegetation, such as the Yazoo Delta or the Atlantic States, is a task which will take many years to accomplish. Frost in winter and drought in summer, and the growth of parasites, which may be artificially encouraged, are the only means of controlling the spread of the pest, though persistent destruction by picking and burning the affected squares and bolls would also help greatly to keep it under. Another line of defence, however, is to breed earlier maturing varieties of cotton, which may bring a considerable part of the crop to maturity in time to resist the worst attacks of the boll weevil.

Early Maturing Varieties.

The experts of the Bureau of Plant Industry in the Federal Department of Agriculture have devoted a great deal of time and attention to this work, with considerable success.

But even if the boll weevil were extinct to-morrow, the increase of the American cotton area would still be hindered by another difficulty, namely, the lack of sufficient labour. Cotton has always been regarded as a cheap-labour crop, that is to say, a crop that can only be profitably cultivated where there is an ample supply of cheap labour. Such a supply of labour was obtained in the United States by the introduction of the slaves, who, though neither very industrious nor efficient, could be trained to the necessary processes of cultivation and picking. Indeed, it is admitted that a good negro is the best cotton cultivator, if he can be persuaded to do his best. But since the liberation of the slaves, good negroes have become almost the exception; the average "nigger" has an incurable aversion to steady and especially to prolonged labour. Two or three days' labour will earn a wage sufficient to keep him for a week, and that is all he wants. Nothing will persuade him to work six days a week, let alone seven, even in the busiest parts of the picking season, when, owing to the uncertainty of the weather, a day's delay may mean irreparable damage to his crop. No matter what happens, he must have his Saturday off to go to town and buy "rations" and spend his week's wage. Even when the land and the crop are his own, he seems to have no desire to make more money than is sufficient to keep him, and is quite content to remain a day-labourer all his life, when a few years of steady hard work and careful saving would put him in a position of independence, from which he might easily rise to comparative affluence. The scarcity of labour has

Labour-Supply.

Negro Inefficiency.

only resulted in raising the general level of wages, and enabling the negro to adopt a higher standard of living and copy the luxuries and the vices of the white man. A horse and saddle to ride to town with on Saturdays, expensive clothes and the best brown boots that money can buy, gold-filled teeth, and gramophones, are his idea of life. The contrast between all this and the position of the Egyptian *fellah*, with his unlimited capacity for patient plodding work from morning till night, for almost seven days a week, and from one year's end to another, on a wage of less than a quarter of that of the American negro, which yet enables him to maintain a standard of living that makes him the healthiest and strongest agricultural labourer in the world, is painful in the extreme.

High Wages and Standard of Living.

Contrast with Egypt.

The result is that not only has the labour cost of the American cotton crop increased out of all proportion to the rise in price, but in many districts labour is simply unobtainable in sufficient quantities for the proper cultivation and handling of the crop. Deep ploughing and thorough preparation of the ground are impossible, while even the cultivation of the crop is very inefficiently performed for the same reason, and the rows must be kept wide apart to allow of the use of horse cultivation. But it is at the picking season that the loss due to insufficient labour causes most damage. Where the negro is his own master, custom, not the condition of the crop, dictates when he shall begin the harvest. Should the crop mature early, while the full heat of August is still felt, nothing

Picking Delayed.

will persuade the negro to face the arduous task of a day's work in the fields, with the result that his fields may be seen white with cotton for a week or a fortnight before work is started. The delay may bring rain, which will reduce the value of the standing crop by 5 per cent. a day, and the picking season is dragged out until a third or a half of the crop has suffered damage which could easily have been prevented. Cotton may be seen standing in the fields all through the winter, and the writer heard of cotton that had not been picked until March. As one grower very forcibly put it to him, "We are growing a crop of 20,000,000 bales, and only harvesting 15,000,000, and half of that in bad condition."

Heavy Loss.

To this probably more than any other cause is due the increasing proportion of more or less unspinnable cotton which was so marked in 1911. The crop was there in excellent condition, but was ruined before it could be picked.

The cost of picking, as of wages in general, has gone up in recent years by leaps and bounds. It varies, of course,

Cost of Picking.

in different districts, but is probably nowhere less at any part of the season than 50 cents per 100 pounds of seed cotton. During the season it rises materially, owing to the relative scarcity of the cotton, and the greater time and trouble taken to pick it. In Texas the rate used to begin at 60 cents per 100 pounds, rising to a dollar at the end of the season, and the average throughout the season was said to work out at about 85 cents; but in 1913, in the first week of the season, the pickers struck for 70 cents, and, owing to the difficulty of obtaining labour at any

price, the planters had to give in. This scarcity, by the way, was aggravated by the Mexican war, which prevented the usual supply of transitory labourers, who in ordinary years cross the border in large numbers during the picking season.

For this unfortunate state of affairs there is no apparent prospect of relief. Additional labour is being poured into Texas by thousands *per annum*, of immigrants of every nationality under the sun, but there is so much new land being thrown open every year for cultivation in small holdings that the new supply is sucked up as by a sponge. The old ranches of thousands of acres in extent are being broken up and sold in lots of 160 acres, which are rapidly taken up by the new settlers. The cotton area in Texas alone has increased from 7,801,578 acres in 1903 to 12,597,000 acres in 1913. The demand for labour is therefore enormous, and will in all probability continue to increase faster than the supply. On the other hand, it has been pointed out that for many years a great deal of labour has been occupied in clearing lumber throughout the Cotton Belt, and as this work approaches completion, a considerable amount of labour will be set free, which may find its way into cotton growing.

Position in Texas.

With such a shortage of labour, it is natural that attempts should have been made to produce a mechanical cotton-picker. Various methods have been tried such as the Price-Campbell machine, which resembles a traction engine in appearance, and is designed to pass over the cotton, while a number of mechanical hands, in the form of revolving spindles,

Picking Machines.

pick the lint from the plant. Others have been tried on the principle of vacuum suction. So far, however, the difficulty seems to be that the machine requires nearly as much labour to attend it as would pick the cotton. It seems, therefore, that there is little hope yet of a solution of the labour difficulty in this direction. In any case, it would not meet the difficulty of the small planter, who could not afford to buy one, even if it were profitable to invest so much capital in a small holding.

Other Costs increasing.

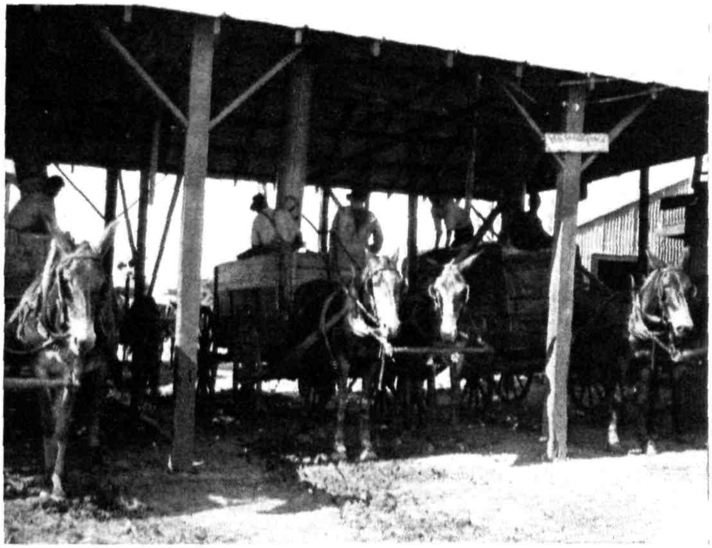
The increased labour cost is only one item in a general increase of the whole cost of production, which is creating a very serious position for the average cotton grower. All kinds of implements, animal power, feeding-stuffs, and fertilizers have in recent years gone up in price to an alarming extent. An actual case may be taken as an illustration of the effect which these conditions are producing on the supposed profits of the cotton grower. The figures given on the following page were supplied by a Scotch planter in Texas, and represent accurately the conditions in the district in which they are taken. These figures are intended to show the full economic cost of production, including interest on and depreciation of capital, seed, manure, labour, supervision, and all other expenses. The result is to show that the actual net cost of production of the cotton (after deducting the value of the seed), not allowing anything for rent or interest on the purchase price of the land, and taking the yield as 200 pounds per acre, was fully 8½ cents per pound. As a matter of fact, the landlord takes one-fourth of the lint and seed as rent;

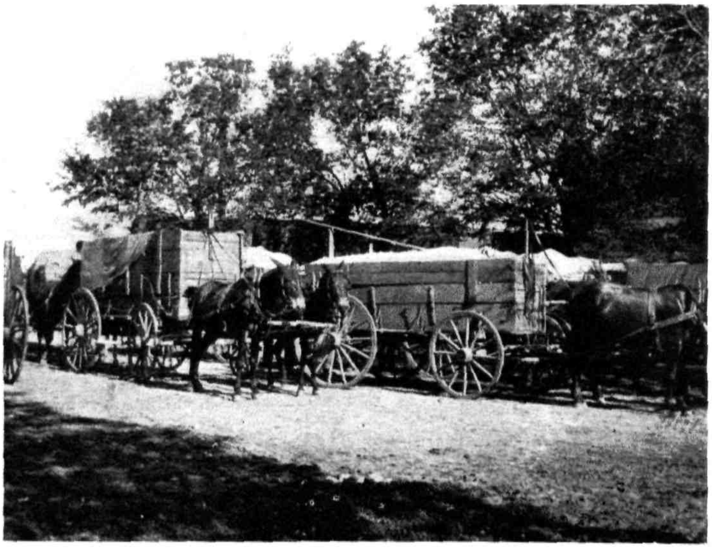
Cost of Production in Texas.

ESTIMATED COST OF PRODUCTION OF COTTON IN TEXAS IN 1913.

FARM OF 100 ACRES HELD UNDER CROP-SHARING LEASE, THE LANDLORD TAKING ONE-FOURTH OF THE COTTON (LINT AND SEED). YIELD TAKEN AS 200 POUNDS LINT AND 400 POUNDS SEED PER ACRE.

Tenant's Capital :—	$.	$.
4 mules	700.00	
Harness	32.00	
Breaking plough	55.00	
2 cultivators	75.00	
2 planters	60.00	
2 waggons	180.00	
1 pair harrows	15.00	
1 stalk cutter	26.00	
6 hoes	3·60	
Scales for weighing cotton	1.75	
Buggy and harness	130.00	
Horse or pony	150.00	
Cotton sacks	10.20	1,478.55
Interest charge thereon at 10 per cent.		147.85
Depreciation charge thereon at 12½ per cent.		184.82
Cotton Seed:		
75 bushels at $2.00		150.00
Labour :		
2 hands for 6 months at $20 each	240.00	
Chopping cotton twice	150.00	
Picking 40 bales at (average) 85 cents per 100 pounds of seed cotton	510.00	
Weighing cotton at 75 cents per bale	30.00	
Hauling cotton to ginnery 24 days at $2	48.00	978.00
Ginning and Baling :		
Weighing at ginnery at 10 cents per bale	4.00	
Ginning, baling, and wrapping at $3 per bale	120.00	124.00
Stock Feed :		
450 bushels corn at 50 cents	225.00	
365 bales hay at 50 cents	182.50	407.50
Supervision :		
Estimating the wages of a manager for 1,000 acres at $100 per month		120.00
		2,112.17
Value of Crop :		
40 bales cotton at, say, 12 cents per pound	2,400	
40,000 pounds seed at $20 per ton	400	
	2,800	
Less one-fourth share to landlord	700	2,100.00





1. SUCTION PLANT REMOVING THE COTTON FROM THE WAGGONS.

2. WAITING THEIR TURN AT THE GINNERY, SOUTH TEXAS.

on this basis, it will require a price of fully 12 cents per pound to leave the farmer any profit. But in 1913, owing to the drought, the yield was considerably less than 200 pounds per acre, and, owing to the subsequent rain-storms, which came too late to help the crop and too early to avoid doing damage to the harvest, the cotton was so deteriorated that some of it fetched only 6 cents per pound.

It is not claimed that this case is typical of more than the actual conditions prevailing in Texas; these conditions may be more favourable in the older parts of the Belt. Again, 1913 was a very unlucky season in Texas; but the facts are sufficient to show that, in many cases at least, the profits of cotton growing are by no means so large as we were apt to imagine. The position is practically this, that under such conditions cotton cannot be grown at a profit *if all the labour it requires has to be paid for*. Unless the small planter has a large family to do part of the work, cotton at present prices will not pay. Such conditions may be all very well for the negro, whose standard of living (for his children) has always been low; education, for example, is only now beginning to be thought necessary; but they will not do at all for the small white planters, who, in Texas especially, are very numerous, and who might have proved the hope of the cotton trade under more favourable conditions. In other words, it means that cotton is, and must remain, a "black man's crop," not a white man's, and that probably means a speedy check to the spread of cotton growing in Texas and other Western States, from which the greater part of the recent increase of area has come.

The whole state of affairs above outlined raises a very serious question as to the future of the American Upland crop. The boll weevil has not yet done its worst; the average yield of the crop throughout the Belt is very low, and its cost of production is mounting to such a point as to come dangerously near the extinction of a reasonable profit. It does not require much foresight to see that things cannot go much farther in these directions without seriously damaging the prospects of increase in the crop. If nothing can be done to mitigate the ravages of the boll weevil, or to reduce the cost of production of the crop by mechanical appliances, the only remaining hope lies in the direction of increasing the value of the crop either by raising the average yield, or by improving its quality so as to command a higher price; for it must be remembered that while the basis price of Middling American has in recent years been steadily rising, the proportion of lower grades in the total crop has been increasing. In these circumstances it seems to the writer that the question of improving the yield and quality of the crop has now become of the very first importance.

The Future.

Improved Value.

It is satisfactory, therefore, to know that in both these directions a great deal of good work is being done. How much there is to be done may be inferred from the single fact that the average yield of the American crop throughout the whole Belt is less than 200 pounds of lint per acre as against about 450 pounds in Egypt. It is admitted that the American yield could be greatly increased; it has been proved in

Increased Yield.

every case where proper methods of cultivation, including good seed and the use of fertilizers, have been adopted. At the same time, it is now established that everything that tends to increased yield would also help to improve the quality of the crop, for it is now definitely proved that all the conditions which tend to a high yield, such as good soil, suitable climate, and proper cultivation, are equally beneficial in their effect on the quality of the crop, both in character and length of staple. But the first essential to the improvement of the cotton crop in America, as everywhere else, is the improvement of the seed-supply. In this direction America has still a long way to go. The average small grower pays very little attention to the quality of the seed he uses; seed selection is entirely outside his experience. No precautions are taken in the ginnery to prevent mixing of seeds; the same seed is used over and over again, and the inevitable result is deterioration. Only the most enlightened of the large planters will face the trouble of selecting seed themselves, or the extra expense of using the improved varieties of seed which are coming on the market from many different sources.

Seed Selection.

The question of the improvement of the crop by seed selection divides itself into two parts—(1) The general improvement of the seed-supply throughout the whole Cotton Belt by the selection of better varieties of Upland cotton suitable for all districts, and (2) the discovery and development of those specially favoured districts, where, owing to good soil and favourable climatic conditions, cotton of an improved type, which may be classed as

long staple cotton in the widest sense, can be profitably grown. The second of these questions will be more fully dealt with in a later chapter. Under the first heading it is now certain that new varieties of Upland cotton can easily be obtained which would give much better results both in yield and quality than the present average. There is no excuse nowadays for the great quantity of "nigger cotton," as it is called, which is still to be found in almost every district. The Federal and State Departments of Agriculture, as well as many private growers, have placed on the market many new varieties of excellent cotton of fully 1 inch staple; but it seems to be almost impossible to convince the ordinary small grower, especially the negro, that it would pay him to spend a little more money and get these improved seeds.

Staple Cottons.

This, however, is not altogether the fault of the grower, for in America, as elsewhere, one of the great obstacles to the improvement of the crop is the difficulty experienced by the more enterprising growers in getting the fair market value for better qualities of cotton. For this the system under which the great bulk of the crop is bought in the districts is largely to blame. The large export firms in New Orleans, Galveston, Savannah, etc., have their buyers all over the Belt, who buy up cotton of all grades in the small market towns and villages, and forward it to their headquarters. There it is graded and classified according to the types which these large houses have established for their own trade. These buyers are in most cases experienced men with a good knc..ledge of the cotton

Marketing.

seed are distributed over the whole district, but has also organized a system of handling and selling the entire crop of the district. He himself buys all good cotton produced there at its fair market value, and after grading and classifying it, ships it himself to the American mills or to Europe. The result is that practically the whole district has been turned over from growing the old-fashioned short staple cotton to improved types of from an inch to an inch and a quarter staple. The fact that such work may, if properly done, prove not unprofitable to those who undertake it, does not detract from its very praiseworthy character, and it is most desirable that the consumers, who have as much to gain from it, should recognize and encourage it.

An Example.

Another matter in which there is great room for improvement in American methods is that of the ginning and baling of the crop. The present system may be briefly described as follows: After being picked, as already described, the cotton is taken to the local ginnery, where the seed is separated from the lint. Not many years ago there were in the small villages throughout the country great numbers of old-fashioned small-gins, driven by horse or mule where water-power was not available. These, however, have now been very largely replaced by modern steam or even electric plant, generally containing from four to eight or more gin stands of the saw-gin type, which is almost universal in America, with a box press for putting the cotton up into the usual flat or farmer's bale. On the whole the equipment of these country gins is astonishingly good, and the flat bale they turn out is quite remarkably creditable.

Ginning.

Labour-saving appliances have been very highly developed. Thus the cotton is taken straight from the farmer's waggon by a pneumatic suction-pipe, which is directed by the man in the waggon, and cleans every particle of cotton out of the waggon in a very short time.

Labour-Saving Equipment.

If the gin plant is free, the cotton is carried by the suction directly into a system of hoppers above the gin stands, from which it falls, sometimes through beaters or fanners for cleaning purposes, into the gins below. Each gin as a rule consists of about seventy circular saws running at about 400 revolutions per minute. The upper edges of the saws passing through slots in a frame, pull the lint through, while the seed falls back into a trough or box, along which it passes by a travelling screw or suction into the store outside.

The Gin.

The lint is drawn, still by suction, into a closed lint-flue that runs along behind all the gin stands. At one end of this lint-flue a small steam-pipe is inserted, so that in case of a "flash fire" in the flue a strong jet of steam may be turned on the cotton, which, being dry and hot from the gin and flying loose like snow-flakes in the suction, is in an extremely inflammable condition, sufficient, it is sometimes maintained, to produce spontaneous combustion. The lint-flue leads into the condenser, where the cotton is formed into a loose "lap" and falls in folds into the press-box.

The pressing machinery is usually of the double press-box type, with a screw press worked by steam or hydraulic power from below, and moving on a circular platform, level with the floor of the gin-room. One box is placed

under the condenser, and when filled is swung round over the screw press, while the other box takes its plaçe under the condenser. While the box is being filled, the cotton is lightly pressed down about every half-minute by a mechanical tramper or packer from above—a very useful appliance, which, however, has given rise to serious trouble. Where the ginnery is steam-driven, as it is in the majority of cases, the packer is operated by a steam cylinder placed vertically above the press-box. As this cylinder is only working for, say, a few seconds every half-minute, there is an inevitable tendency to condensation, and unless the piston is very carefully packed and constantly attended to, the condensed steam trickles down and drops into the cotton below. Again, if for any reason, such as meal-times or a temporary stoppage of the gins, the press-box is left for a time half full, the operator seldom takes the trouble to swing the press-box half round so as to clear the drip from the packer, with the result that even a very trifling leakage may produce quite a serious wet spot in the centre of the bale. The writer himself saw cases in which the leakage was very material; in one case at least as much as half a pint in ten minutes, while in another case steam was escaping from the cylinder all the time. Every stroke of the packer brought up some cotton on the upper side, which, until the next stroke, lay close up to the cylinder, receiving the full benefit of the steam. When the press-box was full, the negro in charge calmly swept all this cotton, soaking wet, into the box to form a damp spot which would spread through the whole side of the bale

Pressing.

Leaky Packer Cylinder.

and ultimately ruin by "felting" a considerable proportion of the contents, if the condition of the bale had not in the meantime been detected at the compress.

This may seem a very trifling matter, but it was so universal that the cumulative effect is sufficiently serious.

Water-Packed Bales.

It is probably the cause of 90 per cent. of the "water-packed" bales which cause so much trouble and loss to the spinner, who receives the bale perhaps six or twelve months later and finds that the small damp spot has spread into a great lump of rotten and felted cotton weighing a good many pounds.

Some of the gin-makers have provided a special by-pass or escape-pipe in the cylinder to allow of the condensed steam being blown off; but the mere presence of such an appliance is of little use unless the negro in charge will take the trouble to use it carefully, while it does not meet the case of a badly packed joint.

In recent years the export and shipping associations at the large ports have been making great efforts to secure

Standard Bale.

the adoption of a standard size of press-box (and consequently of the bale) of 27 by 54 inches, and these efforts seem now to be meeting with considerable success. The density of the flat bale is usually much under 20 pounds per cubic foot, and its net weight a little under 500 pounds. The covering consists of two pieces of jute bagging not large enough to meet over the ends or the flat sides of the bale. The

Bagging.

quality of the bagging has greatly improved in recent years, and although old bagging is still used again, it is generally in quite satisfactory condition, a system of repairing it having recently been

adopted. Six bands are put round the bale in the press, and the total weight of tare is about 20 to 22 pounds. In one ginnery in Texas the writer saw a very neat but simple mechanical contrivance for cutting off the pieces of bagging, which was a marked improvement on the usual rough-and-ready way of hacking them off by hand. This not only gave a much neater result, but it also had the advantage of giving a uniform tare, and at the same time was a saving of labour, which is of some importance where labour is so costly. It suggested a further improvement which seems worthy of consideration by the bagging makers—namely, that the bagging instead of being sent out in long rolls should be made in cut pieces of standard size with finished ends.

But the treatment of the flat bale after it leaves the press is much less satisfactory. Sometimes the ginner is himself the purchaser of the cotton, and the first thing he does when the newly made bale is rolled out on the gin platform is to slash an ugly hole in the canvas of the rounded sides, which form the top and bottom of the bale in the press-box, and to draw from the hole a liberal sample of about a pound in weight. Asked why the sample could not have been taken from the press-box before it was baled, most of the ginners could only reply that it was not the custom, and the only reason which further inquiry revealed was that a sample of unpressed cotton did not look the same as a sample taken after it had been pressed. Asked again why the sample could not be taken from the uncovered sides or ends of the bale so as to avoid cutting the bagging, the answer was similar—a sample taken from the top or

Sampling.

bottom opens up almost like the leaves of a book and just as the cotton fell in folds from the condenser into the press-box. Besides, it would be more difficult to draw a sample from the hard-pressed sides; it requires an auger to do it.

This question of sampling may seem trifling, but as a matter of fact it lies at the root of the whole question of the American bale. For when the bale goes to the town yard or market for sale, every prospective buyer considers it his duty, or his perquisite, to take a similar sample from every bale he looks at, and as no one will take a sample from an old hole, the bale is soon cut to pieces; three or four holes on each side is nothing unusual.

Lack of Shelter.

If not immediately sold, the bale lies in the town yard or is taken home to the farmer's own yard, where in either case it lies totally unprotected from the weather, and as the rainfall is sometimes very heavy, the effect on the condition of the bale can be imagined. Sometimes skids of heavy timber are placed under it to protect it from the worst of the mud, but to put it under a roof or to put a waterproof cover over it would be thought as unnecessary as it is impossible.

Compressing.

When the cotton is finally sold, the bale is shipped by rail to the most convenient port for export; but it must first go to the nearest compress to be put in order for shipping. These compresses are to be found in most of the larger towns throughout the Belt as well as at all the chief ports. The law or custom of the trade empowers the railway companies to have the flat bale repressed at the nearest compress to the point

at which the cotton was received, so as to reduce as far as possible the demands on waggon space, which is hopelessly insufficient during the height of the season. All cotton is supposed to be carried entirely in box cars, but that is a counsel of perfection, and most of the consignors would rather have it despatched at once on an open flat car than delayed for a closed car. Much of it, of course, goes by river, and a great river steamer loaded with as many as 9,000 bales of cotton is an impressive sight. As these river steamers have very little freeboard, the amount of water splashed up on the lower tiers of bales may be imagined.

Transport by Rail.

Or River.

When the bale reaches the compress it is unbanded again, the top and bottom cloths being held together temporarily by wire clips. The loose bale is then trundled into the compress, and just before the press comes down, or, rather, up on it, rough pieces of sacking are thrown over it (others having previously been laid on the press platform under it) to cover the sample holes in the original bagging. Bands, increased to eight in number instead of the original six, are now slipped round the bale in the press, the old bands of previous bales having been cut down to the shorter length required by the reduced dimensions of the bale, while the pieces cut off are riveted together by hand to eke out the number. If the negroes tending the press take the trouble to pull up the lower bagging cloths on the sides of the bale, they can quite easily be made to overlap the upper cloths, and this is generally done at the ends, which are hastily stitched together; but in the hustle

Sample Patches.

and rush which are inevitable when 200 bales per hour are being put through the press—and one compress manager actually boasted to the writer that he had put through over 2,000 bales in a ten hours' day—there is little time to spare for such refinements. The result is that the bale finally leaves the compress in a very unsatisfactory condition, the tare unduly increased by the sample patches, the chief object of which seems to be to make up the customary 6 per cent.* tare, the ends very insecurely fastened, the sides half uncovered, and the bands likely to break or spring their catches with any severe twist or wrench, such as is inevitable in a journey of 4,000 miles or more by land and sea. The final result is the tattered and draggled bale which is familiar to everyone in Lancashire, and which is unequalled by the product of any cotton-growing country in the world except, perhaps, Mexico.

The Finished Bale.

It is not difficult to put one's finger on the root cause of this defective system, which, indeed, lies simply in the absolute lack of any real system or continuity of interest throughout the whole process. Nobody cares whether what he is doing, or the way in which he does it, will produce a satisfactory result in the hands of the man who comes after him. Everybody admits that the result is bad, but the fault lies in no one stage of the process, and no one man can mend it. In recent years the International Federation has made great efforts to draw attention to the matter and to secure reforms. They have repeatedly published

No Through Interest.

* Now reduced to 5 per cent.

statistics showing the tremendous aggregate loss entailed by the present system, in the form of actual loss of cotton from the bales, damage done to what remains by damp and dirt, heavy freight and storage charges owing to the unnecessary bulk of the bale, and increased insurance charges owing to its unsafe condition. Thus, for example, a cotton warehouse will hold 50 per cent. more bales of Egyptian cotton than of American, though each Egyptian bale weighs nearly half as much again as the American. The cost of handling of, and the insurance premiums on, American cotton in Liverpool are from 30 to 100 per cent. more than those for Egyptian cotton. But all this evidence of sheer waste and direct loss has not yet been sufficient to compel the alteration of the system. The growers seem to be under the impression that the loss falls entirely on the consumer.

The ideal remedy for this state of affairs may best be suggested by contrast with the conditions prevailing in Egypt. There the whole system is centred in the large export houses of Alexandria, who in most cases buy the cotton from the growers, often in the field. The majority of the ginneries belong to a great combine in which these same export houses are largely interested. The farmer's bale goes to Alexandria for sale, and before export is entirely re-baled with new bagging and bands and under a high pressure producing a density of about 35 lbs. per cubic foot as against the American 22½ lbs., and a tare of less than 3 per cent. as against the American 5 or 6 per cent. They are then exported in many cases to shipping houses on the other side, which are branches of

Contrast with Egypt.

the Alexandria firms, and which again in many cases hold substantial interests in the mills that finally spin the cotton. The result is, that from the time the cotton is picked, its treatment is under the eye of someone who has a direct interest in producing the best final result, and the comparison between Egyptian and American bales in a Liverpool warehouse points the moral.

Unfortunately, such an ideal system has not yet been found possible in America, and to introduce it would mean a revolution, against the whole weight of established custom and vested interests. These and the present habit of sampling are at the root of the trouble. If it were not for the latter there would be no need for re-pressing at all. By a modification of the existing system the bale could be put up at the ginnery in quite good final condition; but the present system is so ingrained in the trade that any attempt to change it would arouse hostility at every stage in the process. Probably the strongest opposition of all would come from the owners of the compresses, whose plant, involving many million pounds sterling, would become so much old iron. As the compresses in many of the smaller towns are locally owned by large numbers of small shareholders, while in others the railway companies have considerable holdings, it will be readily understood that the opposition would be very formidable indeed. For similar reasons there seems to be no prospect at all of the compress owners being induced to remodel their practice on Egyptian lines by rebaling *de novo*. It is not merely a matter of cost—though that would be very serious, it would certainly pay in the long-run—the insuperable difficulty is, that it

Opposition to Reform.

would take far too much time. The whole methods of handling the American crop are dominated by the frantic speed at which it is supposed everything must be rushed through during the height of the season.

Gin Compressing.

If this objection is to be held valid, no modification of the existing compress system is possible at all, not even a few comparatively simple changes, which would mean a great improvement at very small cost. The only remedy is the general introduction of the gin-compress—that is to say, a heavier and stronger press at the ginnery, which will put up the original bale in sound condition and of sufficient density to go right through to the consumer without re-compressing. But the possibility of such a system is absolutely dependent on the abolition of the present sampling system, which must be replaced by a system of certified samples taken from the press-box. These might be in triplicate, one being returned to the grower, the second retained by the ginner, and the third going right through with the bale to the spinner. But such an ideal system involves many difficulties. In the first place the great majority of the ginners have not sufficient capital to meet the cost of a gin-compress; but even if they had, a much more serious difficulty lies behind the fact of their being as a rule small men. The trade could not be expected to have confidence in samples certified by such men.* Adding these diffi-

Press-box Samples.

* Some use might be made of the mechanical sampler, an attachment which automatically takes a sample of the whole contents of the bale as it passes from the condenser into the press-box.

without the loss of the pounds and pounds of cotton, which under the present system are extracted as samples or lost from the sample holes. It is no exaggeration to say that the prevention of these small losses, and the savings which would otherwise be possible to a properly compressed bale, are in the aggregate so enormous that they would amply repay any company that had sufficient foresight to see the advantages of such a system, and worked on a scale large enough to command confidence. It is not likely, however, that such a scheme will ever become possible without the co-operation of the European consumers, not merely in finding the capital, but also in creating a market for the improved bale when it comes, and in securing adequate reward to those pioneers who take the trouble to inaugurate the new system.

Mexico.

Mexico seems to be one of those exasperating countries where the possibilities of cotton growing are, beyond all question, immense, but the actual production under existing conditions is comparatively small. Not much reliance can be placed upon such statistics as are available with regard to the amount of the crop, especially as a large part of it is consumed in the country; but the statistics, such as they are, indicate a crop of from 150,000 to 200,000 bales per annum. How far this falls short of the possibilities of the country for cotton growing may be inferred from the fact that the country possesses an area greater than that of the whole American Cotton Belt (765,000 square miles), and that not only is a very large

proportion of this area suitable for cotton growing, but cotton is actually being grown in small quantities throughout nearly the whole of the country. Thus, in the north-east, all along the valley of the Rio Grande River, from El Paso to the Mexican Gulf, and in the Laguna district south of that line, there are in every province large areas of land where the conditions for cotton growing are excellent. In the north-west, in the valley of the Colorado River, immediately adjoining the Imperial Valley across the United States border, experiments have already shown that Egyptian cotton of the first quality and good American long staple cotton can be successfully grown under irrigation. Finally, all down the Pacific coast-line, and it must be remembered that the Pacific coast-line of Mexico extends to 3,883 miles, while that of the United States (except Alaska) is less than 2,500—in every state from Sonora in the north to Oaxaca in the south, cotton is at present being grown. All the physical conditions in this immense area seem to be nearly ideal for cotton growing. The country consists of a large plateau, rising to 8,000 feet above the sea-level, and including, in its gradual elevation from the sea-coast, all varieties of temperature from tropical heat to a climate like that of Northern Italy. Northwards it slopes to the Rio Grande River. The rainfall along the Pacific coast is ample, but in the Central Plateau it is insufficient and ill-timed for the growing of cotton; where necessary, however, it can be supplemented by irrigation from numerous small rivers on the west coast, and larger tributaries of the Rio Grande in the interior. The population is very large, probably over 15,000,000 (again about the same as the

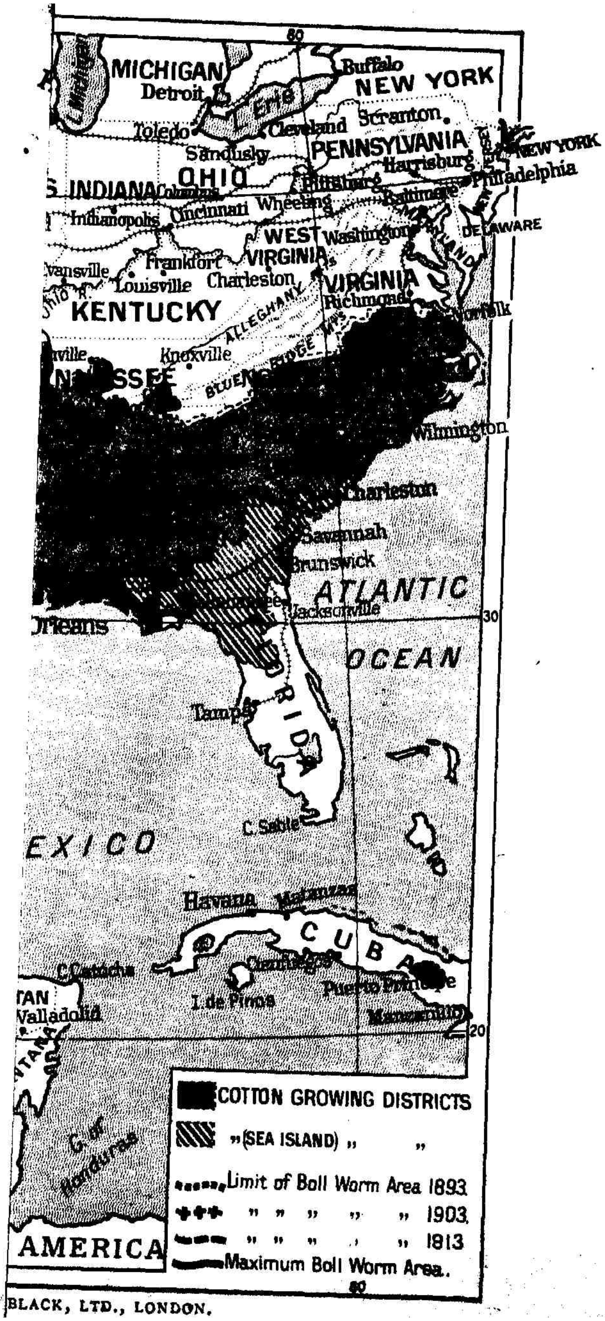
Pacific Coast.

American Cotton Belt), and consists very largely of Indian peons, who are said to be good agriculturists, patient, and industrious, and greatly superior to the American negro. Wages are comparatively low, farm labourers earning from 1s. 6d. to 2s. 6d. per day; and Chinese labour under contract has been introduced for cotton growing in the north.

The class of cotton generally produced is probably of about the quality of Upland American. The staple is said to be strong, and averages over an inch in length. There is little doubt that it could easily be improved. The American long staple variety, Durango, came from the province in Mexico of that name. More than half of the crop (over 100,000 bales in a good year) is at present grown in the Laguna district towards the north, which includes portions of the states of Coahuila, Durango, and Chihuahua. There production depends almost entirely upon irrigation. The average yield is said to be about half a bale per acre, but it is very variable, as the supply of water in the Nazas River is unreliable during the growing season. Lack of water in spring often prevents sowing cotton at all. Nothing has been done towards conserving or regulating the supply, though plans had been prepared before the present political troubles broke out. Egyptian cotton has also been successfully grown at Monterrey, in the state of Nuovo Leon. All the large estates have their own gins, and the seed is crushed in local factories.

Durango.

Owing to a high protective duty on imported cotton, the Mexican grower gets a price considerably in excess of the American basis, and nearly all the crop is taken



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by local mills, in the Laguna district and farther south in Puebla and Mexico City. Very little cotton is exported, and the local mills even import American cotton, in spite of the duty.

To convert all this promise into really great achievements—say, a crop of 1,000,000 bales in a couple of years' time—only one thing is lacking, but that the one essential, namely, peace and good government. As long as the present state of civil war continues, the economic development of the country is not only suspended, but is actually moving backwards. If, however, by some fortunate turn of events, this magnificent country could secure some guarantee of permanent peace and security, there seems to be almost no limit to its possibilities for growing not only cotton, but very good cotton.

Central America.

The completion of the Panama Canal will entirely alter the economic importance of the various small republics of Central America, all of which are believed to possess great natural wealth. The opening up of these countries will lead to the development of their agricultural possibilities, in which cotton is almost certain to be included, though so far little is known of their capabilities for cotton growing. In Nicaragua, the largest of them, a good deal has been done on a small scale; and it is said that, given peace and improved labour conditions, cotton might have a very considerable future before it in the lowlands of Nicaragua. About 300 bales were exported in 1910, but no information is available as to the

Nicaragua.

quality of the crop. The great bulk of the export went to the United Kingdom.

British Honduras.

At one time the Indian natives of British Honduras grew cotton of two local varieties, but an effort made by the Government to introduce Sea Island cotton seems to have met with little success, owing to an insect pest, apparently the cotton worm. This could surely have been overcome, but nothing further seems to have been done in the matter.

The chief rival of cotton in most of these Central American States is fruit, especially bananas, for the United States markets.

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CHAPTER VIII

THE PRICE OF AMERICAN COTTON

Speculation—American legislation against futures—New York Exchange and fixed differences—Holding up the crop—Federal Reserve Banks—Government reports on area and condition—Ginners' returns.

As the price of American Middling is the controlling factor in the prices of all the world's cotton crops, it may be well at this stage to attempt an outline of the various influences which affect the fixing of the basis price. It is an economic truism that the price of a commodity is the result of the balancing of the forces of supply and demand. As has already been pointed out, however, in the introduction (Chapter I.), the demand side of the equation has in recent years become the predominating factor in the case of cotton. The consumption, in the writer's view, has been limited only by the supply, and even the unprecedented crop of over 16,000,000 bales in 1911 found a ready market at a relatively high price. Nor is there any prospect of an early change in these conditions. The annual consumption of the American mills alone is increasing almost as fast as the American crop.

The Basis Price.

Effect of Increased Consumption.

The question of paramount importance, therefore, is

the prospect of an increased supply of American cotton in the immediate future. As we have already seen, such an increase depends upon the area cultivated and the average yield produced. The latter is largely a matter of weather, choice of seed, methods of cultivation, and the depredations of the boll weevil; the area sown, on the other hand, is limited only by the labour-supply, the boll weevil, and the prospect of a remunerative price. There are millions of acres suitable for cotton cultivation; the American crop could be doubled within the next few years, and its average quality greatly improved, if the necessary labour and capital were available and a reasonable profit assured. Most of these difficulties have already been discussed, but it remains to explain one very unsatisfactory feature of the situation. This is the impression, which is almost universal among the small growers, that they are not fairly treated by the consumers, or it may be by the middlemen; that, whether or not the consumers are paying a fair price, it certainly never reaches the growers; and that all the profit is somehow or other being caught by the middlemen and kept out of the pockets of the growers. The vague word "speculation," which is used to cover so many sins, is continually on the growers' lips, and the feeling that things would be altogether different if these wicked speculators could be wiped out is a conviction which no amount of argument will shake. Whether right or wrong, the mere existence of a feeling so widespread and so bitter is most undesirable; specially when on such matters as improved

Need of Increased Supply.

Dissatisfaction of Producers.

Speculation.

quality and better methods of handling the crop, the consumers are constantly demanding so much from the growers. The extent to which this feeling of soreness has permeated the whole supply side of the cotton trade is, perhaps, hardly realized on this side by the consumers, who are puzzled by the demands for legislation directed against the trade, which seems to them unreasonably hostile.

The Clarke Amendment.

Such, for example, was the Clarke amendment to the Tariff Bill of 1913, which proposed a tax of $\frac{1}{10}$ cent per pound (or 2s. per bale) on all contracts for the sale of futures. When it is remembered that practically every bale of cotton is "hedged" several times over, and that the total sales of "futures" are many times the size of the actual total crop, it will be seen that the burden of such a tax on the cotton industry would be very serious indeed if there were no way of escaping it; it was, in fact, frankly and avowedly prohibitive. The provision that the tax would be refunded in every case where the contract actually eventuated in the delivery of cotton entirely failed to meet the case, for, of course, the great majority of future contracts are never completed by delivery. They are not intended for that purpose, but rather as an insurance to cover the risks of a corresponding contract, by a spinner, for example, who has contracted for future deliveries of yarn. This points to the idea that a contract which does not end in the delivery of actual cotton is necessarily speculative in the worst sense of the term, in other words, that it is simply gambling. It is, of course, hardly to be wondered at that the ordinary small planter

Hedging.

should have little understanding of the meaning and necessity of *bona fide* hedging, and it must be admitted that his difficulty in understanding the matter, if it were explained to him, would be increased by the fact that in America there is an immense amount of speculation in cotton futures by outsiders, who have neither genuine interests requiring covering nor any knowledge of the conditions of supply and demand. This kind of speculation seems to have developed in the United States to an extent quite unknown in cotton circles in England, and it has been fostered by a system under which brokers' clerks bringing in orders receive part commission. The fact remains, therefore, that the American cotton grower is bitterly prejudiced against the whole class of cotton speculators, whom he regards as his natural enemy. There is equally little doubt that this idea has been fostered by politicians who wanted an attractive policy to secure the support of the farming interests, as represented by the Farmers' Union, for electioneering purposes.

State Legislation against Futures.

In many states stringent laws against cotton futures have been passed, but as there are only two futures markets in the country, New York and New Orleans, these state laws did not much matter. The proposed tax, however, would have applied to the whole Union, and its withdrawal has since been followed by two other attempts to secure the same result, the one by a separate Bill, known as the Lever Bill, on more moderate lines than the original proposal, and the other, known as the Senate Bill, an attempt, by means of the Federal post, to stop dealings in futures by a ban on the necessary correspon-

dence. In the Lever Bill the proposed tax was raised to 1 cent per pound, or 5 dollars per bale.

The persistence of this agitation among the growers seems to justify an attempt to explain the real economic function of futures; the effort may be further excused by the fact that the writer has frequently found among small manufacturers and users of cotton in this country a similar idea that the speculators are making money out of it, and that the fluctuations of price which puzzle and annoy them so much are due to speculators rigging the market and not to the actual conditions of supply and demand.

Meaning of Futures.

Under modern conditions, anticipation of future needs is the essence of business enterprise. Every manufacturer must make goods for future demand, which it is his business to estimate accurately in advance. It follows that, as he is dependent on the future selling price of his goods, he must take into account the probable future price of his raw materials. The considerations upon which the future price of cotton depends are exceedingly complicated, and the increasing specialization of modern business has led to the development of a class of experts, who devote themselves entirely to the study of the conditions of future supply and demand. The intelligent anticipations of these experts serve a useful purpose, because, by raising or lowering the present price, in view of the future conditions which their experience and knowledge enable them to forecast, they can actually modify the present market conditions so as to mitigate the future fluctuations. Thus a cotton broker, foreseeing a short supply from the next crop, raises his

price for future contracts, which reacts upon "spot" prices, thus tending to check the present demand and spin out the supply as far as possible to meet the expected shortage. Without such skilled and well-informed anticipation, the present demand at a low price might exhaust the available supply, causing a sharp rise in price later on, when the deficiency of the crop manifested itself in a short supply. Thus anticipation, which is speculation in the true sense of the word, tends to check the fluctuations of price, which are equally bad for the producer and the consumer.

Function of Futures Markets.

These experts, then, have created a system of futures markets, situated among the growers on the one hand, and the spinners on the other, and the legitimate function of these markets is twofold: (1) They provide centres in the cotton-growing districts where the opinions of all those on the spot as to the probable future course of supply are crystallized for the information of all parties interested, including the producers as well as the consumers; and (2) they provide similar centres in the manufacturing and consuming districts of the trade, where that information may be acted upon by those who have further information as to the probable future course of demand.

Thus the course of prices in New Orleans, Alexandria, and Bombay represents the opinion of those in touch with the growers of the American, Egyptian, and Indian crops respectively as to the prospects of their supplies, and this information is cabled to New York, Liverpool, Havre, and Bremen, where the brokers are in touch with

the consumers. The stoppage of such information from the growers' centres would be a serious economic loss to the trade as a whole; and the abolition of futures markets, such as that of New Orleans, which would be the almost inevitable result of the proposed tax, if there were no way of avoiding it, would be an undoubted mistake from the point of view of the producer as well as of the consumer.

New York Exchange.

It was all the more unsatisfactory, therefore, to learn that the quarrel was really with the New York Exchange, which is only a futures market without any real spot market at all, and not with New Orleans, though New Orleans was likely to suffer as well as New York by certain of the proposals. For some time the Federal Government has had its heart set on reforms in the methods of handling cotton, including the setting up of uniform standard grades for American cotton throughout the whole country, and, if possible, throughout the world. The government experts have made up a set of nine official grades—four above Middling and four below, ranging from "Middling fair" down to "good ordinary"—and they have been making efforts to get these grades adopted by the various spot and future exchanges throughout the Cotton Belt. New Orleans, as well as Galveston, Memphis, Charleston, Mobile, Natchez, Little Rock, Macon, and St. Louis, which are only spot markets, have adopted the new grades as the basis of their quotations; but New York until lately insisted on adhering to its own much more complicated system, which contained no less than twenty-three grades tenderable under contracts. Of

Government Grades.

these there were sixteen of white cotton, nine above and six below Middling, ranging from "fair" down to "good ordinary," and seven grades of tinged or stained cotton from "strict good Middling tinged" down to "low Middling stained." All but two of the latter were below "Middling white," which is graded as equal to "good Middling tinged." Thus the seller who elected to tender cotton against his contract had the choice of eleven grades below Middling, any of which the buyer was bound to accept.

Fixed Differences.

But there was another peculiarity of the New York Exchange methods to which exception was taken, that known as the system of fixed differences. The "points on" or "off" for the different grades above and below Middling which might be delivered under contracts, were not left to be settled in accordance with the actual market values of the different grades from day to day, but were fixed periodically at long intervals, only two or three times a year. Needless to say, these fixed differences were frequently out of touch with actual market values. Generally the discounts on the lower grades were too small, that is to say, these grades were overvalued.

History of the Present Grades.

On both these points the New York Exchange authorities claimed that their practice was originally adopted in the interest of the growers themselves, who were now asking for its reversal. The standard classification then in use in New York was adopted at a convention of all the cotton exchanges in the country, held at Augusta (Georgia) in 1874. Originally the bye-laws of the Exchange provided

that no cotton lower than low Middling should be delivered under contracts. But as the cotton crops began to increase in size during the early '80's, the southern planters found that there was a good deal more low-grade cotton than could be readily sold. They blamed the New York Exchange for excluding this cotton from delivery on contract, and as a concession to these demands the Exchange lowered the limit to good ordinary.

System of Grading and Classing.

In 1888, owing to complaints by the planters that grades of cotton were manipulated in New York to suit large interests, an independent salaried board of classers was appointed by the New York Exchange to class cotton, according to the standard types. Again, prior to 1890, when cotton was delivered on contracts, its invoiced value was based on the actual value of the grade at the time of delivery—that is to say, New York followed the system of commercial differences—and once more it was because of complaints from the South of manipulation of the grade valuations that the New York Exchange adopted the system of fixed differences, which were settled twice, and latterly three times a year.

Objections to Fixed Differences.

The feeling in the South against the system of fixed differences seems to date from the crop of 1906-07, when, owing to bad weather, the proportion of low-grade cotton was unprecedented. An "error of judgment" of the Revision Committee of the Exchange, in fixing the values of the lower grades of cotton too high, threw the whole weight of these conditions upon the New York Exchange, causing its future contracts to sell relatively lower than

those of any other market, owing to the fear of deliveries being made under contract of low-grade cotton at excessive prices. The result was a bitter campaign against the New York Exchange, and in 1908 the House of Representatives ordered an inquiry into the whole business of handling and selling the cotton crop. This was carried out by Mr. Herbert Knox Smith, of the Bureau of Corporations; and in a voluminous report he, among other things, condemned the New York system of fixed differences. The popular objection to this system seemed to rest on the idea that the values of the lower grades were generally fixed too high, with the result that when there was known to be an excessive supply of low grades on the market (which has frequently been the case of late years), the basis price of Middling, upon which all contracts are made, was unduly depressed, and all other prices, including spot prices throughout the Belt, were correspondingly affected.

While the New York Exchange may have been slow to move in response to the apparent change of public opinion, it cannot be denied that they have latterly shown a spirit of compromise which seemed to augur well for the settlement of the controversy. In October, 1913, they appointed a committee, which reported in favour of alterations designed to bring the form of contracts and the rules and practice of the Exchange more into line with popular opinion, which, however, they still held to be entirely wrong. They agreed to adopt the government grades as the basis of their classification, though not confining deliveries under contract to the nine grades of white cotton alone, which

Changes in New York.

so far had been standardized by the government; for they maintained that the elimination of all tinged and stained cotton, and of all cotton with slight defects, would exclude a large part of every crop, and nearly 50 per cent. of the entire crop in a season like that of 1913-14, when there was an abnormal proportion of low grades. With regard to differences, they would not go to the full extent of adopting daily revisions, but adopted a monthly valuation, which was to be based as far as possible upon quotations received from the southern spot markets. They pointed out, however, that there was still great confusion among the spot markets of the South as to quotations and grades, and suggested that before they could go further, the government must compel the southern cotton Exchanges to adopt their standard types.*

Progress of Legislation.

In the progress of the two Bills above referred to through the legislature, the idea embodied in the Senate Bill of using the Federal post as the means of securing the desired end did not prove generally acceptable, which is not surprising, and when the Senate Bill came before the House of Representatives, the latter "amended" it by striking out all but the first enacting clause, and substituted for the remainder what was practically the original Lever Bill. The amended Bill, however, being in reality an entirely new Bill, had to pass the Senate again; but they,

* In May, 1914, a Convention of all the American Exchanges at Augusta (Ga.) recommended the adoption of the U.S. Official Standards, and that these should be made universal if possible. With this in view the U.S.A. Government sent representatives to Europe in November, 1914. From February 18, 1915, daily revision of differences became effective on all the Exchanges.

instead of demanding, as they might have done, that it should go through the whole process of discussion *de novo,* adopted another form of procedure available under such circumstances known as a conference. This means that the Bill is sent to a very small committee of both Houses, who have the fullest powers of adjustment and compromise, and might practically pass the Bill without further ado, though their Report has to be approved by both Houses.

The Lever Bill.

It becomes necessary, therefore, to explain in some detail the provisions of the combined Bill, which is on the whole the nearest approach to a reasonable attempt to deal with the subject that has yet been made. As the proposed tax of £1 per bale would be absolutely prohibitive, it becomes a question of the exemptions allowed under the Bill to contracts which comply with certain requirements.

Contracts Exempted.

The provisions of the Bill on this point fell under two heads, designed to deal with two different forms of contract, the one being the ordinary form of futures contract which is employed alike for legitimate "hedges," and for purely speculative transactions, and the other a separate form of contract for future deliveries of actual cotton. With regard to the first of these, the provisions of the Bill were that the cotton must be of one of the government grades, that settlement must be based on actual commercial differences, and that certain kinds of low-grade cotton should be entirely excluded—namely, cotton below good ordinary, low Middling tinged, or Middling stained; cotton of less than $\frac{7}{8}$ inch staple, or of perished or immature

staple; or cotton that is gin-cut or reginned, repacked, false packed, mixed packed, or water-packed. With regard to the second form of contract, the provisions were that the description and price of the cotton sold should be stated, and that only cotton of the grade or description mentioned in the contract should be delivered thereunder; and the contract must provide that delivery should not be effected by means of "set off" or "ring" settlement, but only by the actual transfer of the specified cotton mentioned in the contract.

Commercial Differences.

In case of dispute as to the quality, grade, or length of staple of any cotton tendered under contract, either party might refer the question for determination to the Secretary of Agriculture, who was also apparently to regulate the whole system of spot markets in regard to determining the actual commercial differences in the value of spot cotton of the grades established by him. He was also authorized "from time to time to establish and promulgate standards of cotton by which its quality or value may be judged or determined, including its grade, length of staple, strength of staple, colour, and such other qualities, properties, and conditions as may be standardized in practical form, which for the purposes of this Act shall be known as the 'Official cotton standards of the United States,'* and to adopt, change, or replace the standard for any grade of cotton established under" the previous Acts.

* This does not mean that the standard grades are to include all these points—that would be impossible—but that supplementary standards dealing with such points may be prepared if found possible.

Finally, a similar tax of a cent per pound was to be imposed upon each order transmitted by any person within the United States for making a contract of sale of American cotton for future delivery on any cotton exchange in a foreign country, unless the form of contract in use on such exchange complied with the provisions of the American Bill.

Foreign Orders.

It was not very easy to see how all this was going to effect the desire of the reformers to abolish speculation. The first object of the Bill was clearly to compel the New York Exchange to adopt the government grades and the system of commercial differences. If they were prepared to do so, the Bill apparently would not in any way interfere with legitimate futures business. What was not clear, however, was how, in that case, it was going to prevent "illegitimate" speculation. But the reformers apparently believed that the alteration of the practice of the New York Exchange would prevent the adoption of certain methods of manœuvring the market which New York was able to adopt under the old system. Their chief hope, however, seemed to be that the exclusion of low grades from delivery under contracts would relieve the price of futures from the downward pressure, which they maintained the old system constantly tended to exert.

But the matter which most directly affects the interests of the European cotton trade in the Bill is the attempt to impose a prohibitive tax upon contracts made by any person in the United States on any foreign cotton exchange unless the form of contract used on these ex-

changes is identically the same as that which the Bill desires to impose upon the American exchanges. It may be supposed that some clause of this kind was thought necessary to prevent dealers in America evading the Bill by transferring their futures business to Liverpool, Havre, or Bremen.

Effect on European Exchanges.

But the promoters of the Bill went much farther than they realized when they proposed in effect that all the European Cotton Exchanges must change their methods and adopt a new American system, simply in order that the government of the United States might coerce the New York Exchange into altering their methods. There are many points, of detail and otherwise, upon which the practice of the exchanges of Liverpool, Havre, and Bremen differs both among themselves and from that of New York, and it would be waste of time to discuss in the meantime whether the European methods are better or worse than those now proposed in New York. It is sufficient in the meantime to point out that the immediate adoption of the American Government grades by all the European exchanges was simply impossible, especially as it was generally admitted, even in America, that the grades at first adopted were by no means perfect. It is possible that, given time for discussion, some agreement might be come to among all the cotton exchanges to adopt a system of international grades, and an international form of futures contract; but that is an ideal the attainment of which is likely to require a great deal of negotiation and adjustment. In the meantime, there-

International Grades.

fore, the proposals of the Bill, on this point especially, seem to call for further consideration.*

Reference may here be made to the attempts which have been frequent during the last few years to create among the Southern planters organizations (such as the Southern States Cotton Corporation, which failed early in 1914), whose objects included the holding up of the American cotton crop for a higher price. The first of these, though not much has been heard of its activities in this particular direction, was the Farmers' Educational and Co-operative Union, founded at Dallas, in Texas, in 1902. This organization has already been referred to as having taken part in the political agitation for legislation against speculation in futures. The planters, being unable to get rid of speculators by such legislation, seem to have planned to defeat them by copying their own methods.

Holding up the Crop.

Thus, after Sully's corner had forced the price to over 17 cents in May, 1904, the inevitable reaction was accentuated by a record crop of 13½ million bales in 1904, and the price fell to under 7 cents. The result was a great movement against the evils of speculation, and in

Southern Cotton Association.

* Since the above was written the Bill has finally passed, with the tax still further increased to 2 cents per pound, and a time limit of six months inserted before the Act comes into operation. The deadlock which might have been expected has been entirely overshadowed by the practical suspension of all futures dealings through the war. It seems probable that when things settle down again, the new system may find itself more easily incorporated into the altered conditions of the cotton world than could have been imagined under any circumstances conceivable when the above was written.

favour of securing more uniform prices, and in January, 1905, the Southern Cotton Association sprang into being as a larger development of the former Cotton Growers' Protection Association, with its centre at Atlanta, Georgia, and Mr. Harvie Jordan as its President.

The 1911 crop was again a record and produced, as was natural, a considerable fall in values from the very high levels which had been touched in 1909 and 1910. But though the average price of the season was really very high for such a huge crop, it did not satisfy the planters, and the Southern States Cotton Corporation came into being in 1912, with its headquarters at Macon, Georgia, and a capital of $1,000,000. It had also offices in Dallas, Texas, and its influence in that state seems to have been considerable.

Southern States Cotton Corporation.

All these Associations possessed certain features in common, though their methods may have differed widely. Their chief complaint was that the planters, not being wealthy men, were forced to realize their crop immediately it was gathered, and were therefore at the mercy of the market, with the result that prices in autumn usually are lower than at other times during the year. If farmers could be assisted to finance the crop and spread it over the season more evenly, a better price could on the whole be obtained. With this object stores were erected, and various methods were adopted to finance the farmers and assist them to carry their cotton over bad times. One cannot help sympathizing with them on this point, especially in view of the very serious rise in the cost of production of recent years.

Stores and Finance.

Unfortunately, however, the leaders of the movement were not content with measures designed to put the growers in a position of equal bargaining power. They next attempted to control prices by reducing the acreage and holding up the supply for an artificial price. At first they were fairly reasonable in their demands. In January, 1905, 10 cents was fixed by the Southern Cotton Association as the minimum price, and this was soon reached quite naturally. In the following spring the acreage was reduced to 26 millions against 30 millions in 1904, partly, no doubt, due to the advocacy of the Association, though the low price was the chief cause. The reduction of the crop helped the natural swing of prices back from the excessively low levels touched in the reaction from the opposite extreme during the corner. Unfortunately, however, this apparent success seems to have engendered the idea among the planters that they were now in a position to dictate prices. So in 1907 the minimum price was raised to 15 cents, market price then being about 11 cents, and for this price many of the planters have been holding part of their crop.

Reducing Acreage.

Minimum Price.

The methods of the Southern States Cotton Corporation were described as follows in one of their own publications. They issue to cotton growers "selling certificates" of the Corporation, which create an obligation on the Corporation to get for the cotton growers 15 cents per pound for their cotton. The plan of payment for the cotton is thus set forth: 11 cents per pound will be paid in cash, or, if the grower elects, in 90 days' scrip bearing 6 per cent. interest,

The Corporation's Methods.

and the balance of 4 cents per pound will be paid in 6 per cent. interest-bearing scrip, interest payable every ninety days, and the principal to be redeemed when the cotton has been sold to the consumer.

The Corporation seems to have secured a considerable following, and up till the early autumn of 1913 many of the planters were still convinced of its soundness. At that time the price of cotton was again about 11 cents, and there seemed no prospect whatever of the 15 cents level being reached; yet it was impossible to convince the supporters of the scheme of the futility of trying to force up the price by such means, unless some turn in the actual conditions of the market should take place to assist them. Such a turn did come immediately afterwards, when the apparent damage caused by drought in Texas sent the price up to about 14 cents. It must then have appeared as if the object of the Corporation was likely to be achieved; but the rise just failed to carry them up to their limit, and their subsequent failure may be taken as the result of the reaction which followed during the winter.

Its Failure.

No one but those immediately concerned will regret the failure of any such attempt to create a corner in cotton, even in the interests of "the proper education of the children of the South, and the social and moral uplift of the masses of the people," for on such high grounds was the scheme commended in the Resolutions passed by the Conference of the Governors of eight out of the twelve cotton states, held at Atlanta on July 12, 1912. Europe is prepared to pay for its raw material whatever may be necessary to

Governors' Conference.

cover the reasonable cost of production, and it has shown in recent years its ability to pay much higher prices than would formerly have been thought possible. There is no doubt that in many ways the position of the growers is not so rosy as was generally thought among European consumers. There are, as we have seen, many ways in which organizations could very materially and properly assist the farmers, both to turn out a better article and to get a better price for it. In every effort of the kind towards such legitimate improvement these organizations would have the hearty sympathy and cordial co-operation of the consumers. It is a great pity, therefore, that that good-will should be alienated by the adoption of such a policy on the part of these organizations. For it must be made perfectly clear that no such method could be permanently successful. The organization of the International Federation was the consumers' answer to Sully's corner, and there is no doubt that any organized holding up by the planters' Associations would be met by the most strenuous opposition on the part of the Federation. The growers probably do not realize the terrible strength of organized short time as a weapon in such a warfare.

The International Federation and Short Time.

Another matter of considerable interest in this connection is the new banking and currency scheme of the United States, approved on December 23, 1913, under what is known as the Federal Reserve Act. The new system of Federal Reserve Banks, which are to receive deposits of government funds, and are to be allowed to invest these and the funds provided by their constituent or

Federal Reserve Banks.

member banks in loans on commercial paper, should have important effects on the moving of the cotton crop.

Their Distribution.

The utility of these banks in financing the cotton crop is, however, likely to be restricted by the peculiar distribution of the twelve federal districts in view of the geography of the Cotton Belt. Texas, the youngest, though now the largest of the cotton states, and the adjoining states of Oklahoma, Arkansas, and the northern portion of Louisiana, should be well enough served by the Federal Reserve Bank at Dallas, Texas, which is geographically about the centre of these Western cotton states. In the Eastern states, Georgia and South Carolina are within easy reach of Atlanta (Georgia), while Richmond, Virginia, is not far from the North Carolina fields. But what of the Central States in the Mississippi Valley, especially the long staple districts centring round Memphis ? The nearest Federal Reserve Bank is at St. Louis, which, though not so very far away in actual distance, is chiefly devoted to different economic interests, and has comparatively little concern in the cotton crop. But the outstanding puzzle of the whole arrangement is the omission of New Orleans, which is still, probably more than any other one town, the real centre of the cotton trade, and which is second only to Galveston, Texas, in the quantity of its cotton exports, (1,705,999 bales in 1913-14). New Orleans is still the shipping port for all the Central and Mississippi states, and it possesses the only futures market in the Cotton Belt. Dallas and Atlanta are equally distant from it and equally impossible. One does seem to be driven to the

conclusion that in arranging these Federal Reserve Districts the financing of the cotton trade was not the chief consideration in view.

Statistical Returns.

To complete the account of the way in which the price of cotton is fixed, it is necessary to describe the system of statistical information published by various departments of the Federal Government with regard to the cotton crop. This consists of three main sets of reports. The first deals with the area sown. A preliminary report is published by the Bureau of Statistics of the Department of Agriculture, in the month of June or July, and a final report six to nine months later, giving statistics of the area which has actually produced a crop, for every year a considerable proportion of the area sown is abandoned for one reason or another. For other reasons, however, the final figure is sometimes higher than the preliminary estimate. It was markedly so in 1913, for example. Then follows a series of five reports, published by the same office at intervals of a month from May 25 to September 25, describing the condition of the crop. These reports are based upon information received from every county and state in the Belt. The aggregate result is expressed in percentages, the figure of 100 being supposed to represent a full, if not an ideal, crop. The percentage figure is given for each state, and an aggregate percentage for the whole crop; and these figures, taken along with those of the estimated area in each state, provide a very useful indication of the

Area Estimate.

Condition Reports.

condition of the growing crop at any time, as compared with the same period of any previous year. The Weather Bureau publishes weekly during the cotton-growing season, statistics of the distribution of rainfall, temperature, etc.

Weather Reports.

When picking begins, the third series, known as the Ginners' Reports, comes into operation. These are published by the Census Bureau of the Department of Commerce, and are founded on returns obtained from all the ginneries throughout the Belt. They are published at intervals of about two or three weeks from September 1 to January 16. They are completed by the publication in December of a government estimate of the crop; and, finally, the whole information with regard to each season's crop is collected and published, in a Bulletin called "Cotton Production," by the Bureau of the Census, which also contains information on other points, such as the spread of the boll weevil, the distribution of cotton in the United States, and a certain amount of general information as to the world's cotton crops. The Bureau of the Census also publishes annually a special Bulletin on the supply and distribution of cotton in the United States, the world's consumption and stock of cotton, and the trade in cotton and its manufactures.* In future, however, these two Bulletins will be merged into one.

Ginners' Reports.

Crop Estimate.

Cotton Bulletins.

* The International Cotton Federation's Statistics of the world's spindleage, consumption, and stocks of cotton of all kinds have already been referred to.

In addition to these, there are almost innumerable private reports and publications with regard to the cotton crop from both the side of supply and demand; so that if in the multitude of counsellors is wisdom, those whose living depends on the fortunes of the American crop ought to be well posted.

Private Reports.

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CHAPTER IX

BRITISH WEST AFRICA

The British Cotton Growing Association—Sir Alfred Jones—Gambia, Sierra Leone, and the Gold Coast—Lagos and Nigeria—Progress and prospects.

Birth of the Movement.

THE development of cotton growing in British West Africa has been so largely the work of the British Cotton Growing Association, that any description of the results achieved must be prefaced by some account of the history and work of the Association. In the closing years of the nineteenth century the situation with regard to the supply of cotton had begun to give rise to considerable anxiety. Already in 1900 the Germans had begun to develop cotton growing in their African colonies. The first step which led to the formation of the British Cotton Growing Association was taken at the annual dinner of the Chamber of Commerce at Oldham (the chief home of the spinning of American cotton in Lancashire) in January, 1901, when, on the suggestion of Mr. Benjamin Crapper, a committee was appointed to make inquiry into the possibilities of growing American cotton in other countries, and particularly within the British Empire. The committee's report, published in November, 1901, was favourable, and on February 18, 1902, the matter was further discussed at a representative meeting held at the Manchester Chamber of

Commerce, when an influential committee was appointed. In the meantime the late Sir Alfred L. Jones had taken up the matter on his own account, and in May, 1901, had sent out 10 tons of American seed to the West African colonies. On May 7, 1902, Mr. J. Arthur Hutton, acting as Chairman of the West African Committee of the Manchester Chamber of Commerce, invited Sir Alfred Jones, and some of the leading West African merchants, to dinner at the Albion Hotel, Manchester, and at that dinner the British Cotton Growing Association was born. At a general meeting of the various associations and other bodies interested, held at the Manchester Chamber of Commerce on June 12, 1902, the Association was formally inaugurated, Sir Alfred Jones being elected President, and it was decided to raise a guarantee fund of £50,000. A fair response was made to the appeal for funds, considerable subscriptions being received from the organizations representing the cotton operatives, as well as from the employers.

Formation of the Association.

First Appeal for Funds.

The Oldham Committee had already, through the Colonial Office, instituted inquiries into the possibilities of cotton growing in our various colonies, and these were now followed up by consignments of seed and machinery to various countries which had been pointed out as suitable for experiment, and by grants to planters and others, while experts were sent out to various parts of the British Empire to inquire into their possibilities. The results were so satisfactory that, in November, 1903, it was decided to increase the guarantee fund to £100,000. At this stage the matter

Preliminary Inquiries.

suddenly acquired increased importance from the peculiar conditions of the cotton market, due to the operations of speculators, headed by an American named Sully. Taking advantage of the short crop and the active demand for cotton, they succeeded in engineering an effective corner of the supply, and rushed the price up from 5⅞d. in November to nearly 9d. in January, 1904. From then till March the price kept fluctuating violently between 7d. and 8⅞d., and it was not till the end of June that cotton again stood at 6d. These same conditions led to the formation of the International Federation of Master Cotton Spinners' and Manufacturers' Associations, under the presidency of Sir Charles W. Macara, and the first successful attempt to organize short time on an international basis.

Sully's Corner.

Under these circumstances, the British Cotton Growing Association decided to increase their capital to £500,000. In the King's Speech at the opening of Parliament on February 2, 1904, the situation was referred to in the following passage: "The insufficiency of the supply of the raw material upon which the cotton industry of this country depends has inspired me with great concern. I trust that the efforts which are being made in the various parts of my Empire to increase the area under cultivation may be attended with a large measure of success," and the interest thus shown in the matter in high quarters was further proved by the grant of a Royal Charter to the Association on August 27, 1904. It only remains to add that of the capital of £500,000, all but about £14,000 has now been either raised or promised.

Increased Capital.

The work of the Association in India has already been referred to, and its share in the development of cotton growing in East Africa and in the West Indies will be dealt with in their places. It has all along been clear, however, that the best hopes for the development of an entirely new field, which might be expected to add largely to the supply of "bread-and-cheese" cotton—that is to say, cotton of the American Upland type—lay in the enormous territories of British West Africa. At the beginning experts had been sent to Lagos, which was then a separate Crown colony, but was afterwards merged into Southern Nigeria. The conditions being reported suitable for cotton growing, fairly large acreages were put under cotton; but the results were not altogether satisfactory owing to the cost of white superintendence. As experience accumulated, it became evident that the best policy to adopt would be to encourage the natives to become independent cultivators of their own land, rather than to attempt large plantations under European management, with the natives as paid labourers. This has become the fixed policy of the Association, and its success has been really remarkable. Under proper tuition by example and precept, the former in the shape of model farms, which also supply carefully selected seed, the natives have developed into excellent cultivators. This is not altogether surprising, when it is recalled that cotton has been grown in West Africa for probably a thousand years, and has been used to a very considerable extent for the manufacture of native cloths, which until recent years not only supplied 98 per cent. of the local

Lagos.

Native Cultivators.

requirements, but were also exported by river and caravan as far north as the Mediterranean.

Ginneries.

In addition to this experimental work and educational propaganda, the work of the Association has been to provide and maintain modern ginneries throughout the country, to establish a buying system at a fixed price, which would secure to the growers a reasonable and safe remuneration, and to stimulate the government in providing railway and other transport facilities; for the difficulty of transport has so far been, and will probably continue for many years to be, the limiting factor in the development of cotton growing in West Africa.

Buying Price Fixed.

The Hinterland of the great Niger Basin was at that time almost as inaccessible to European commerce as the North Pole. The cost of transport was also the chief factor in determining the fixed price which the Association were prepared to guarantee to the growers. At first sight the price paid—originally ¾d., then raised to 1d., and now to 1⅛d. per pound of seed cotton—seems very low. But it must be kept in view that the average out-turn of lint per pound of seed-cotton in West Africa is still very low—only about 27 per cent., as against well over 30 per cent. in America—with the result that it takes about 3⅜ pounds of unginned or seed cotton to produce a pound of lint. The whole cost of ginning and baling is borne by the Association, and the freight charges by river or rail to the sea, and thence to Liverpool, are very heavy, with the result that a local buying price of 1d. per pound of seed cotton means

Transport Difficulties.

Low Ginning Out-turn.

a total cost in Liverpool of about 6d. per pound of lint. Again, owing to the cost of transport, it is impossible to make much out of the seed, the value of which (about £5 per ton in Liverpool) would be almost entirely swallowed up by the freight. In many places it is used as fuel or manure, and at the Association ginneries for producer-gas.

Equivalent Cost in Liverpool.

Before proceeding to deal in detail with Nigeria, reference may be made to certain smaller areas where earlier experiments were made—namely, Gambia, Sierra Leone, and the Gold Coast. Of these, Gambia was abandoned in 1905, when its total product had reached 300 bales. Sierra Leone was continued until 1907, its total output never having been much over 100 bales. This abandonment, however, did not necessarily mean that these countries were unsuitable for cotton growing, but simply that with the limited funds at the disposal of the Association it was thought better to concentrate on Nigeria.

Gambia and Sierra Leone.

In the Gold Coast the work is still going on, though greatly hampered by lack of transport; but the total quantity produced has fallen from 250 bales in 1907 to 100 in 1913. This is largely due to the competition of cocoa growing, and unless some change takes place in the situation, the abandonment of this area as a cotton-growing centre seems probable. It is therefore to Nigeria alone that the Association now looks to justify the great hopes of cotton growing in West Africa.

Gold Coast.

The territory which formerly belonged to the Royal

is connected with the Niger by channels, which at certain times of the year are navigable only by very small steamers; while Lagos, which is the terminus of the railway, is inaccessible to ocean-going steamers, owing to the insufficient depth over the bar. The result was that all heavy traffic had to be discharged into branch steamers at Forcados for transhipment to Lagos. This, however, is likely to be modified at an early date, as the government are spending a large sum on the improvement of the port of Lagos, so that ocean-going ships may go alongside the river wharf.

Lagos-Kano.

Forcados.

A branch line from Baro joins the main line at Minna, giving an alternative means of through communication by rail and river from Kano to the sea. The latest development is the result of the discovery of a natural harbour at the head of the estuary of the Bonny River, another effluent of the Niger. Here a new port, known as Port Harcourt, is being created, and a railway constructed northwards crossing the Benue River, to join the main line ultimately at Kaduna, where it is proposed to establish the new capital of Nigeria. From the map at p. 172 some idea will be gathered of the distribution of the Association's branches throughout the country, while the figures in the table on p. 200 show the results already attained in actual bales of cotton. From these it will be seen that the development of cotton growing has followed the advance of communications as naturally as water finds its own level. So far the bulk

Baro-Kano.

Port Harcourt.

Extension of Cotton Growing.

of the development has been in the district near Lagos, fed by the railway, with a few stations on the Riger Niger; but the completion of the Baro-Kano line and the establishment of a large ginnery at Zaria point to the probability of a great increase in the supply of cotton from Northern Nigeria.

Varieties Tried.

With regard to the types of cotton grown, experiments were at first made with several varieties, including Upland, Sea Island, and Egyptian. The two latter were practically failures, and the question came to be one between certain native types of indigenous cotton, and the American Upland type, to which, on the whole, the native types are similar.

Native Types and Upland.

The result will probably be the gradual development of a distinct West African type.

Staple and Value.

On the whole, Nigerian cotton is of good length, slightly over an inch, and very strong, though rather rough and harsh in staple, and of a high colour. The price realized is generally a little over the basis price of Middling American, and for some of the better qualities as high as 75 points on. It is now much sought after in Liverpool on account of its remarkable uniformity of staple and small percentage of waste.

Rainfall.

That the climate of Nigeria is suitable for cotton growing is evident from the widespread character of the cotton cultivation, which has been going on in the country for centuries. The rainfall is roughly about 50 inches per annum. There is, however, one serious drawback to the climate—namely, the Harmattan winds, which introduce an element of great

uncertainty into the crop. These are hot, sultry winds, blowing from the interior of Africa towards the Atlantic.

Harmattan Winds.

They are loaded with clouds of reddish dust coming from the desert, and are characterized by extreme dryness. No dew falls as long as the Harmattan lasts, so that vegetation is withered up. They occur most frequently during December, January, and February, which is the height of the cotton season.

The growing season in West Africa is much later than in America. Generally speaking, planting is begun in the

Growing Season.

middle of June for exotic cotton, and goes on to the end of July, especially on rich land. For the native types, sowing from the latter part of July to as late as the beginning of September is usual. The methods of cultivation and

Cultivation.

setting out of the land are, on the whole, very good. The land is carefully prepared, and the cotton regularly planted in ridges at proper distances. The rows are about 3 feet apart for American cotton, and 4 feet for native cotton, and the seed holes are about 15 inches apart in the rows. Five seeds are planted in a hole, which is reduced to three in thinning. Weeding or cultivation is required four or five times throughout the season to keep the land clean. Picking

Picking.

generally begins when the plant is about five months old, *i.e.*, about November or December, and the picking season is spread over a long period. There is sometimes five months between the opening of the first boll and the ripening of the last, so that the crop may run right on into April or May.

The cotton is as a rule picked in fairly good condition, as the natives have been taught to exercise care and pick the cotton clean. The ginning and baling of the cotton being entirely in the hands of the Association, is probably better done than in any other country in the world, with the result that with one pressing the bale is almost as good as Egyptian recompressed bales. The bales are of 400 lbs. net weight, measuring 80 cubic feet to the ton, equivalent to a density of 28 pounds per cubic foot. The American system of mishandling them for sampling purposes, fortunately, does not exist.

Ginning and Baling.

The whole situation in Nigeria may therefore be summed up in a sentence, that the country is now a proved success, and it only remains to consider the possible area to which, in course of time, cotton cultivation may be extended. The total area of the country is immense, for Nigeria is one of the largest of the British tropical possessions. It is calculated to contain approximately 336,000 square miles, or nearly three times the total area of the United Kingdom, and more than half of the area of the American Cotton Belt. The country may be roughly divided into three sections. The low-lying belt of mangrove swamps extending along the whole coast-line of about 450 miles, is interlaced with a maze of rivers, which would be a marvellous system of natural canals but for the mangrove stumps. Beyond this deltaic region lies the great forest belt, full of almost every kind of valuable tropical timber, rubber, gums, kola-oil-palms, and a host of other valuable commodities.

General Situation.

Possible Cotton Area.

Beyond this, again, to the north, is a region of more open country, which grows almost every kind of crop.

Although cotton is cultivated in some of the districts near the coast in what is termed the "Palm Belt," it is to the great area of park-lands farther north that we look for the expansion of cotton growing on a large scale: It is difficult to form any estimate of the possible area, for a large part of the land, probably 75 per cent., must always be taken up with other crops to provide the necessary food-supply for the natives. Making every allowance for this, however, it is probable that somewhere about 25 million acres may be assumed to be available for cotton, and estimating on the basis of an average yield of 100 pounds of lint to the acre—that is to say, about one-half the American average—the possible cotton crop of Nigeria is about 6,000,000 bales of 400 pounds. Such a consummation, however, is a very long way removed from the present record crop of 16,300 bales in 1913.

A Possible 6,000,000 Bales.

The only other question is population, and on that score there need be little anxiety. The native population of the whole country is probably between 17,000,000 and 18,000,000, in spite of the fact that in many districts, especially in Northern Nigeria, the natural increase of the population has in the past been kept down by internal waste and slave trading; but now that the country is under really effective and permanent occupation by the British Government, there is no reason why the population should not double itself in the next twenty years. The white population is approximately 3,000. The

Population.

natives are proving themselves excellent cultivators; the cotton produced is of good quality, and just the type required by the great bulk of the trade. A slight increase in the average yield and ginning out-turn, which may be quite easily attained by steady persistence in careful seed selection, would add very materially to the profit of the grower, and make the crop still more tempting. It must be remembered that West Africa is very far from being a one-crop country, in the sense in which Egypt may be so described, for many other profitable crops are available, and the only way to tempt the natives to grow more cotton is to show that it will pay them better than what they are at present growing.

Rival Crops.

On the whole, therefore, West Africa presents a most hopeful prospect. The "white man's grave" of the old days, thanks to the work of the schools of tropical medicine, is no longer the terror to Europeans that it once was. It will probably never become a white man's country, but that is of less importance in view of the policy which has been deliberately adopted by the Association of encouraging the natives to become independent cultivators. They have wisely recognized that cotton —in Africa, at least—is a black man's crop; and if, as we have suggested in dealing with the American crop, the future of the "bread-and-cheese" cotton growing industry is to lie in those lands where labour is still cheap, we may fairly expect that Nigeria will take its place as one of the chief of these countries.

A Black Man's Crop.

It only remains to acknowledge the assistance, financial

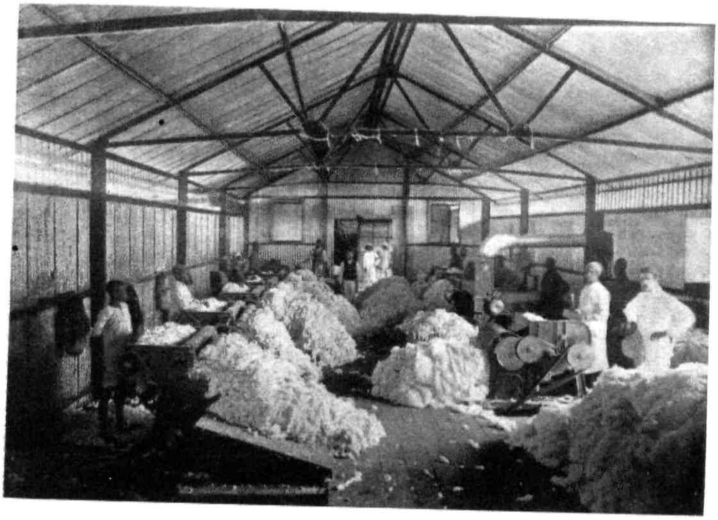
and otherwise, which the Association has received, both from the Imperial Government and from the local governments, in their work in Africa, East and West. In 1904 an agreement was entered into with the government that model farms should be established in various centres for experimental work and seed distribution. The cost of these farms was to be borne by the local governments of Sierra Leone, Gambia, and Southern Nigeria. The Association, on their side, undertook to purchase all seed cotton at a fixed price, to establish buying and ginning centres where required, and to provide travelling experts to encourage the extension of cotton growing.

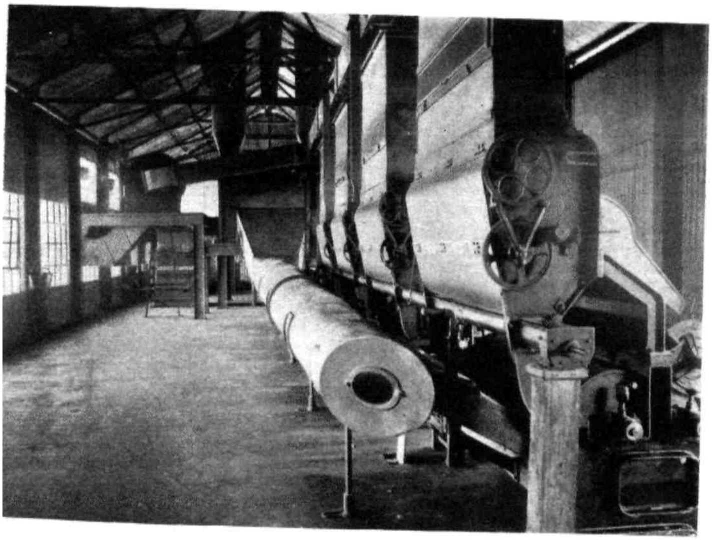
Government Assistance.

This agreement was subsequently modified, and it was arranged that the Association should take over the experimental work at the plantations, and that the three governments should pay them £6,500 per annum, while the Association undertook to spend £10,000 annually in the three colonies on experimental work.

It was subsequently decided that each colony should take over the experimental work in its own area, and a new agreement was entered into with the Home Government, under which it was arranged that the Association should receive a grant of £10,000 per annum from Imperial funds, on condition that they raised additional capital, and undertook to establish and maintain seven pioneer ginning and buying stations. These are at Labolabo and Samale in the Gold Coast Colony; at Illushi, in Southern Nigeria; at Lokoja, Zaria, and Kano in Northern Nigeria ; and at Port Herald in Nyasaland (East Africa). The Association

£10,000 Grant.





COTTON GINNING MACHINERY.

1. ROLLER GINS IN EAST AFRICA.
2. SAW-GIN PLANT WITH PNEUMATIC APPLIANCES, WEST AFRICA.

From photographs kindly lent by the B. C. G. A.

further undertook to provide seed for sowing free of charge in these colonies and in Lagos, and that their staff should devote part of their time to missionary work. It may be added that the amount spent by the Association on this work has always been considerably in excess of the amount of the government grant.

One of the most valuable parts of the work of the Association has been the holding of periodical conferences at the Colonial Office between the permanent officials and the representatives of the Association, which was first inaugurated by the Duke of Marlborough when Under-Secretary of State for the Colonies in 1905.

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CHAPTER X

EAST AND SOUTH-EAST AFRICA (BRITISH)

The Uganda Protectorate—British East Africa—Nyasaland—Rhodesia and South Africa—Transport difficulties—Egyptian and American cotton prospects.

THE three chief cotton-growing areas in the British possessions in this part of Africa are Uganda, British East Africa, and Nyasaland, or British Central Africa, as it was for some time called. Of these Uganda is now producing nearly 30,000 bales,* and Nyasaland about 7,000 per annum; but the crop in British East Africa has just reached 1,000 bales. In all of these areas, as in the case of Nigeria, the great difficulty is transport.

Various Fields.

The Uganda Protectorate, formed in 1895, lies round about and among the Victoria, Albert, and Albert Edward Nyanzas, which form the sources of the White Nile. There are said to be 25,000 square miles of land suitable for cotton growing adjacent to the Victoria Nyanza. The commercial centre of the country is at Kampala, on the northern shore of the lake; but Entebbe, a little farther west, is the seat of government of the Protectorate. The natives have taken up cotton growing seriously, and the crop, as will be seen from the table on p. 200, has increased by leaps and

Uganda.

* The 1913-14 crop promises to reach 45,000 bales.

bounds. The quality of the cotton generally is excellent, and the best of it fetches as much as 2d. or 3d. per pound on Middling American. It is mainly descended from American long staple Upland varieties, those now chiefly employed being Allen's and Sunflower, which here give a staple of 1¼ inches in length. At first a good deal of trouble arose from the mixture of several different varieties of seed, which had been distributed in the early stages; but the matter was taken up by the government on representations made by the British Cotton Growing Association. The inferior cotton having been mostly eradicated, stringent regulations, known as the "Cotton Rules," were brought into force, and the government inaugurated a system of seed control. Attempts have been made to establish a fixed price at which the cotton would be bought from the native cultivators by the large trading concerns, such as the British East Africa Corporation and the Uganda Company, Ltd., who gin and bale it at their own establishments, and forward it to the coast for shipment by rail. There is less need here, however, than in Nigeria for the fixed price, as there is ample competition, and the price is usually maintained about 1¼d. to 1½d. per pound of seed cotton. As the ginning out-turn is only about 29 per cent., this works out at quite a fair price, in view of the high value of the cotton.

American Upland.

Seed Mixing.

Buying Competition.

Transport, as already indicated, is the great difficulty. The cotton is brought in to the buying-stations by the natives in bundles of about 60 pounds, carried on their heads, sometimes for very long distances. Other natives

are then employed to carry it to the nearest forwarding centre. A short railway-line connects Namasagali, on Lake Kioga, with Jinja, on the Victoria Nyanza, from which the cotton again goes by lake steamer to Kisumu (or Port Florence), often after a détour to Kampala to be ginned. Finally, the Uganda Railway carries it through Nairobi, the capital of British East Africa, to the new port of Kilindini at Mombasa. The total journey to the sea may thus be anything up to 1,000 miles, and there still remains the long sea journey to Liverpool by the Red Sea, with the heavy dues of the Suez Canal to face. The result is that the cost of freight runs away with a very large proportion of the price realized, almost worse than in Nigeria.

Transport.

The population of the Protectorate is believed to include over 1,000,000 natives, and as a class they are said to be fairly good agriculturists, though, like all semi-civilized negro races, very loth to adopt habits of regular work. Their wants are simple, and mostly supplied by their own produce; and it is hard to persuade them to work any more than is just necessary to earn what will pay their hut-tax of about 4s. a year, and perhaps buy a few yards of cotton cloth or an umbrella. As labourers in any other capacity, in the ginneries, for example, they are highly inefficient, and the very small wage they receive—2d. to 4d. a day—is quite as much as they are worth. The policy of the government, however, has been, as in West Africa, to develop cotton growing on the lines of making the natives their own masters, and on the whole this policy has been justified by results.

Native Labour.

Wages.

The development of certain parts of the country, especially the islands in the Lake and a belt of about two miles round it, has been greatly hindered by sleeping sickness, as it has only been possible hitherto to clear certain limited districts near the lakes of the deadly tsetse-fly, which carries the disease, and no one is allowed to live within that distance of the water except in these cleared areas.

Sleeping Sickness.

But while the development of Uganda has been so rapid, and is likely to continue satisfactory, it is doubtful whether any really large quantity of cotton, more than, say, 100,000 bales per annum, is likely to be raised here for a good many years to come. The transport difficulty may be greatly modified, but can never be entirely got rid of; though in course of time it may perhaps become no worse than in the Hinterland of West Africa.

Prospects.

In British East Africa cotton growing has so far been confined to a few districts in the southern part of the country, along the line of the Uganda Railway between Victoria Nyanza and Mombasa. The British East Africa Corporation was formed in 1906, and to it the British Cotton Growing Association handed over the whole of their work, which had been arranged with the government on the same lines as in West Africa. This included the Association's ginning plant at Mombasa and the government subsidy of £1,000 a year, to which the Association were bound to add an equal sum for experimental work. The Corporation has since erected other five ginneries, of which, however, two are across the border in Uganda. The

British East Africa.

cotton grown was chiefly of the Egyptian type, but, on the whole, the enterprise has not been a success. The plantations worked by the Corporation and by several other English companies had to be abandoned, and the work of the Corporation has now been mostly transferred to Uganda. The maximum output was 1,000 bales in 1913.

Juba River.

Attempts were also made to develop cotton growing by irrigation in the valley of the Juba River, which forms the north-east boundary between British East Africa on the one hand, and Abyssinia and Italian Somaliland on the other; but in consequence of the probable difficulty of obtaining a sufficient supply of labour, in the meantime, at any rate, it was decided in 1912 to discontinue these experiments. It looks, therefore, as if for some time at least the future development of cotton growing in this part of Africa lies in Uganda, and in the neighbourhood of the lakes rather than near the coast. Further experimental work, however, is being carried on by private enterprise on the Tana River, and there is very little doubt that there are still great possibilities here and on the Juba River.

Nyasaland.

In Nyasaland the results at first achieved by European planters were very disappointing, and the Association adopted the same policy as in West Africa—namely, to encourage the natives to become independent cultivators by guaranteeing a fixed price, the Association providing buying and ginning facilities. A working arrangement was made at first on these lines between the Association and the African Lakes Corporation, and representations were made to the government urging them to establish experimental farms in co-

operation with the Association. Very little has been done, however, in this direction, though a small, but very efficient, Agricultural Department has now been established, and is doing excellent work. Since 1908 cotton growing, both by European planters and the natives, has been increasing, on the whole, steadily and satisfactorily. The quality of cotton grown is the best of all the new cotton-fields. Both Egyptian and long staple American were tried, the latter apparently with special success in the Highlands lying round Lake Nyasa, where the chief hopes for cotton growing on a large scale are centred. The American Upland cotton grown in Nyasaland is said to have fetched 1d. to 2½d. per pound over the price of American Middling, and the Nyasaland Upland type is now thoroughly established. In the lowlands of the Shiré River Valley, Egyptian cotton, especially Abbassi, has given the best results. At Chiromo in this district the Association has a buying and ginning station.

Egyptian and American.

Again, transport is the stumbling-block which prevents the rapid development of this very promising cotton country. Only a small part of the distance from Lake Nyasa to the sea is yet covered by railway—namely, from Blantyre to Port Herald on the Shiré River, a distance of 114 miles, which was completed in 1909. From Port Herald, where the Association has a buying-station, with a ginnery and a powerful press, the route is by barge down the Shiré River till it joins the Zambezi, thence down the latter river to Chindé, on the coast of Portuguese East Africa. Even here, however, the

Transport.

Railways and Ports.

cotton cannot be loaded direct into ocean-going steamers, but must be transhipped into barges and carried to Beira, where it is finally loaded for Liverpool. Proposals for the development of the railways, however, have long been under discussion, and some of these are now likely to be put into execution at an early date. A contract was signed in 1912 for the extension of the Shiré Highlands Railway from Port Herald to the Zambezi, the British Cotton Growing Association having assisted to the extent of £36,200 in raising the necessary capital, and the work is now being rapidly pushed on. Negotiations are also proceeding for the construction of a connecting-line from the Zambezi to Beira, and when this is completed there will be through railway communication from Blantyre to Beira. It still remains, however, to extend this line from Blantyre northwards to Fort Johnston (also a buying-station and ginnery) at the south end of Lake Nyasa. From this point lake steamers provide the next link in the chain of communications to Karonga, a port with considerable traffic near the north end of the Lake. At Vua, near Karonga, the Association has another ginnery. At present the whole output of cotton is blocked by the fact that the Shiré River from Port Herald to the Zambezi is often impassable for months at a time, owing to lack of water, and sometimes almost the whole of the crop is held up for months at Port Herald, waiting for the river to rise. The further extension of the railway eastwards into Northern Rhodesia, via Fort Jameson, is only a question of time, when the Nyasaland Railway will become one

Projected Extensions.

River Transport.

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of the main trunk lines of South-East Africa, to be linked up ultimately with the projected Cape-to-Cairo line.

Until these improvements in transport facilities are completed, it is difficult even to estimate the possibilities of cotton growing in Nyasaland. The crop in 1913 was 7,500 bales (including Rhodesia), but it seems certain that a considerable supply of superior cotton may be looked for at no distant date. Again, however, there is no possibility of anything like 100,000 bales within the immediate future.

Prospects.

Coming still farther south, the next great area of British territory in which cotton may be looked for is Northern Rhodesia, where a small subsidiary company was formed in 1910 by the British Cotton Growing Association and the Chartered Company of British South Africa to develop the industry; but the results attained by this company have not been very successful, and the financial interest of the Association was withdrawn in 1912. Attempts have also been made to develop cotton growing in the country as a native industry, but so far no great quantity has been produced. There has, however, been a considerable extension of cotton cultivation in North-Eastern Rhodesia, in the neighbourhood of Fort Jameson, under the auspices of the North Charterland Exploration Company, with the assistance of the Association.

Northern Rhodesia.

The quality of cotton grown in these districts has been, on the whole, very satisfactory, some of the best substitutes for Egyptian cotton having been grown in Rhodesia; but no suitable native types seem to be available, and it takes a long time to acclimatize exotic varieties.

The crop in North-Eastern Rhodesia is said to have been over 2,000 bales in 1912, but again the difficulty of transport stands in the way, and it seems doubtful whether any really large development is possible until Fort Jameson is connected by railway with the Zambezi, by the extension of the Shiré Highlands line through Blantyre.

Prospects.

In the territories now included under the control of the Union Government of South Africa a considerable number of experiments have been made in cotton growing, but for some reason these have not led to success on a commercial scale, and the country has earned the title of the "land of samples." In the Transvaal, in Natal, and in the old Cape Colony, most excellent cotton has been produced, some of the samples having fetched the highest price of any cotton grown in British territory; but so far it has not been found possible to carry the industry beyond the experimental stage.

South Africa.

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CHAPTER XI

OTHER AFRICAN COLONIES

German Africa: Togoland, the Cameroons, German South West Africa, German East Africa — French possessions: Algeria and Tunis, Senegal, French Guinea, Ivory Coast, Dahomey, French Congo, Madagascar, and Somaliland—Eritrea and Italian Somaliland—Angola and Portuguese East Africa—The Belgian Congo—Summary and statistics for all Africa.

ALMOST every nation in Europe has now taken up the question of developing cotton growing in its tropical colonies. Germany, indeed, was the first in modern times to start such a movement, having, as already mentioned, anticipated the establishment of the British Cotton Growing Association by a year. The German Colonial Agricultural Committee (Kolonial Wirtschaftliches Komitee) was established at Dresden in 1896, for the purpose of promoting the agricultural development of the German colonies. In 1900 they sent out their first cotton mission to West Africa, and since then they have devoted a great deal of attention to developing cotton growing in all the German colonies in Africa. Every other nation interested in the great continent, including France, Portugal, Italy, and Belgium, has followed suit; but, as will be seen from the table on p. 200, the British

German Colonial Committee.

colonies in Africa still hold a long lead in the amount of cotton produced. In fact, the output of the British colonies in East and West Africa alone is double the total cotton crops of all the other European Powers in Africa put together.

It is hardly necessary, even if it were possible, to discuss in detail the development of all these areas. It will serve the purpose to indicate their geographical position, it being understood that the conditions of cotton cultivation are, on the whole, similar to those in other adjoining areas already described.

Thus, Germany possessed four separate areas in Africa. Of these, Togoland lies to the east of the British Gold Coast Colony, on the north side of the Gulf of Guinea, and is separated on the east by a strip of French territory (Dahomey) from Lagos (Nigeria), the development of which has already been fully described. Again, on the east of Nigeria the German Cameroons extend from the Gulf northwards to Lake Chad, being surrounded on the east and south by the French Congo territory. The German colony of South-West Africa is bounded on the south and east by British South Africa, and on the north by the Portuguese colony of Angola. On the east coast, German East Africa lies between the Victoria Nyanza on the north, Lake Tanganyika, one of the sources of the Congo, on the west, and Lake Nyasa, the source of the Shiré River, which flows into the Zambezi, on the south. It is bounded on the north by Uganda and British East Africa, on the west by the Belgian Congo, and on the south by Rhodesia and Portuguese East Africa.

German Africa.

Of these four German possessions, the first and last, Togoland and German East Africa, have so far made the greatest progress in cotton cultivation. The conditions in Togo are, on the whole, similar to those of Nigeria. The general line of development has been to encourage native cultivation by discovering suitable varieties of cotton, local or American, teaching the natives the best methods of cultivation, and providing ginning plant, buying-stations, and arrangements for the distribution of selected seed. Incidentally, a good deal of experimental work has been done with Caravonica cotton, a tree cotton, of which great hopes were entertained, but which, so far, has not been regarded as a success in any of the British possessions where it had been tried. Cotton of the American type has been grown with considerable success in Togo, as well as other varieties, more of the Indian type. The latest figures give the total production of Togoland in 1913 as 2,200 bales of 250 kilos (550 pounds). It is not expected now that Togoland will ever produce any very large quantity of cotton. No efforts have been spared by the government to develop the industry, and probably the only reason for its slow progress is the rivalry of the palm-oil crop, which gives as much profit, with less trouble.

Togoland.

Prospects.

There are two railways from the Port of Lome inland to Misahohe and Atakpame, and one along the coast to Anecho, from which another line inland is contemplated. These railways are fed by an excellent system of roads throughout the Hinterland. For its area (33,660 square miles), Togoland is probably

Railways.

better served with communications than any other part of West Africa. All the existing railways are said to be paying well, recalling the statement of the President of the British Cotton Growing Association (Mr. J. Arthur Hutton) that it is impossible to build a railway in Africa that will not pay.

Cameroons.

In the Cameroons matters have not yet advanced much beyond the experimental stage, but the high-lying districts of the interior appear to be well adapted for cotton, which not only grows wild everywhere, but is largely cultivated by the natives for their own use. The Benue River, a tributary of the Niger, runs through the northern part of the territory; but the development of railways will be absolutely essential before the country can really be opened up for cotton growing. So far the amount grown is very small. There is only one small railway-line inland from the Port of Duala, which, however, is projected to extend to Garua, on the upper reaches of the Benue River. When it does so, a very large area will be available for cotton growing.

South-West Africa.

In South-West Africa only the northern portion of the Protectorate has as yet been found suited to cotton, but some exceedingly fine cotton has been grown, almost equal, it is said, to Sea Island. Again the difficulties of transport and the necessity for irrigation have so far prevented any large results being attained. This country is relatively well supplied with railways, one line running inland from Swakopmund, near the small isolated British possession of Walfisch Bay, to Grootfontein, and another from Angra Pequena. These

two lines are connected by an inland line parallel to the coast, which, however, stops short of the northern boundary of British South Africa, the Orange River.

German East Africa.

German East Africa, as already stated, lies between Uganda and Nyasaland, and its cotton cultivation seems to partake to some extent of the characteristics of both. As will be seen from the map at p. 172, there is no very large area in any one district already under cotton; but there are over a dozen detached areas in different parts of the country in which the conditions differ materially from each other, and each has to be separately studied and differently treated. The total quantity produced, however, is considerable ; 8,768 bales of 250 kilos was the final figure in 1913, for example. Cotton is grown as a catch-crop on many of the rubber and sisal plantations to get a temporary revenue while the others are coming to maturity.

Large Estates.

Generally speaking, cultivation by the natives is being encouraged, though apparently successful attempts have also been made with large estates run by planters, and many of the German spinners took an active interest in the development of these plantations. Labour is expensive, and the supply insufficient, and the use of agricultural machinery is greatly hindered by the tsetse-fly, which renders the employment of oxen impossible. Some of the large plantations use steam-ploughs. American Upland cotton has been tried with great success, and now forms the bulk of the crop; but Caravonica has been a failure. In certain districts a good deal of cotton of Egyptian character has been grown

under irrigation, and the extent of rivers and lakes, and the general terrace-like formation of the country, which is favourable to irrigation works, seem to point to the development of irrigation as the general future of cotton growing here. In certain districts the rainfall is insufficient, and does not come at the right season. As in other parts of Africa, however, the building of railways and the development of other means of communication is the essential preliminary to the extension of the cotton area. Two lines are already in operation. The one runs from the coast at Tanga, near the northern boundary of the colony, to Moshi, at the foot of Mount Kilimanjaro, a distance of 110 miles. The other, known as the Central Railway, was completed early in 1914, from Dar-el-Salaam, the chief port (and the Colonial Committee's Depot), to Kigoma on Lake Tanganyika, a distance of approximately 780 miles. From Kigoma lake-steamers will connect with the Belgian-Congo railway system on the other side of the lake. The eastern section of that line, from Kabalo, on the upper reaches of the Congo (Lualaba) River, to Lukuja, on the lake, is already under construction, and at the end of 1913 only twenty-six miles remained unfinished.

Railways.

Trans-Africa.

The proposed Cape-to-Cairo line is to pass up the east side of Lake Tanganyika through Kigoma. This great project is now completed as far as Kambove, about 150 miles north of Elizabethville, in the Belgian Congo, and the next section to Bukama, which is the extreme limit of navigation on the Congo (Lualaba) River, is in an advanced state of construction. The Beira-Mashonaland

line intersects the Cape-to-Cairo line at Buluwayo, in Southern Rhodesia, so that in a very short time there will be through communication by river and rail between Cape Town on the south, Beira and Dar-el-Salaam on the east, and Boma, at the mouth of the Congo, on the West Coast of Africa.

Cape to Cairo.

The Portuguese railway from Lobito Bay, near Benguela, will also intersect the Cape-to-Cairo line somewhere between Kambove and Bukama. This line, however, is still a long way off, though it is being pushed forward energetically. The capital of the company is British, though being in Portuguese territory, its management is seated in Portugal.

Benguela Railway.

In view of its central position with regard to these various trans-African railways, the future of "German" East Africa is obviously a matter of great interest to England, and especially to Lancashire.

FRENCH COLONIES.

The French dominion in Africa is of enormous area, and although large parts of it will never be anything but desert, there are many parts where the possibilities of development are great. It touches the coast at six different places, all of these being practically separate colonies, but united by the great hinterland of the Sahara Desert, known as Upper Senegal and Niger, or the French Soudan. These coastal areas may be enumerated as follows: In the north Algeria and Tunis lie on the Mediterranean coast. Senegal, on the Atlantic coast, consists of the valley of the Senegal River, and the upper part of that of

French Africa.

Mediterranean Coast.

the Gambia, and includes Cape Verde, the most western point of Africa. The small detached British settlement of Gambia cuts into the French territory here, occupying the lower basin of the Gambia River, with Bathurst as its capital.

Atlantic.

South of Senegal, French territory again touches the coast between the small colony of Portuguese Guinea on the Rio Grande and Sierra Leone, this part being known as French Guinea. Again passing inland, it strikes the Gulf of Guinea at the Ivory Coast, between Liberia and the British Gold Coast Colony. Again, a little farther east, between Togoland and Lagos, a narrow strip of French territory, known as Dahomey, stretches to the coast. Finally, the French Congo, lying between the German Cameroons and the Belgian Congo Free State, provides another approach from the sea to the French interior.

Gulf of Guinea.

French Congo.

In addition to these, France possesses a small but important piece of territory on the Somali coast, at the south end of the Red Sea, including the port of Jibuti, through which most of the trade of Abyssinia passes. Again, the island of Madagascar and its neighbour, Reunion, lying off the coast of Portuguese East Africa, belong to France. In all of these small quantities of cotton are grown.

East Coast.

French West Africa.

In an area so very widely scattered it is impossible to go into detail with regard to each separate colony, but it may be taken as generally true that Senegal, Dahomey, and the other French West African possessions, resemble the

British and German possessions in the same area, both in regard to their climatic and other conditions and the kind of cotton they grow.

The development of the necessary railway and other communications in and between these numerous sections of what should be theoretically a united territory is a task the magnitude of which might well give pause to the boldest colonizer. Already, however, a great deal has been done, and railways are being pushed into the interior from every part of the coast. Those from St. Louis and Dakar, in Senegal, require only the completion of one section of about 100 miles in length to bring them into touch with the inland line already constructed in Upper Senegal, which links up the basins of the Senegal and Niger Rivers at Kayes, the limit of summer navigation on the Senegal, and Koulikoro respectively. Those from Konakry, in French Guinea, to the source of the Niger, from Grand Bassam, on the Ivory Coast, and from Kotonou, the port of Dahomey, are now stretching considerable distances inland, and should, before long, come within measurable distance of linking up the whole of this part of the interior of the Dark Continent with satisfactory communications by river and rail. Altogether these railways now extend to about 1,500 miles, and they pay!

Railways.

In Algeria considerable success has been achieved both with American and Egyptian cotton in different districts, according to climatic conditions; but in Tunis the limit of extension seems to have been reached, and the total quantity produced is comparatively insignificant. An unreliable water-supply

North Africa.

seems to be the stumbling-block. Near Casablanca, on the Atlantic coast of Morocco, a German company has begun cotton growing, but the industry is as yet only on a small scale. Madagascar has not yet got beyond the experimental stage, the highest output recorded having been under fifty bales. The total area of Reunion is small, and its crop is inconsiderable.

Madagascar.

The table on p. 200 gives the latest statistics available as to the production of cotton in all the French colonies in Africa. The increased production shown in these figures is largely the work of the French Colonial Cotton Association, which was founded in 1903, and which has worked in the French colonies and dependencies on lines similar to those of the British and other associations.

French Association.

ITALY.

Of the Italian possessions in Africa, only Eritrea, or the Italian Red Sea Province, with its port of Massowa, has so far been producing any material quantity of cotton. There is little doubt, however, that parts of Italian Somaliland may some day be made available, especially the Italian side of the Juba River Valley. This valley is said to be like the Nile Valley in climate and quality of soil, but with better levels for irrigation purposes. It is spoken of as ideal country for growing the finest cottons under irrigation, but as both the political and economic conditions necessary to its development—*e.g.*, security, labour-supply, and capital—are still

Red Sea Province.

Jubaland.

lacking, any immediate development of cotton growing on a large scale is unlikely. Reference has already been made to the experiments carried out on the south bank of the Juba River in British East Africa. A joint scheme for irrigation works will apparently be the first step towards any serious development of the country.

Tripoli.

Tripoli, the new Mediterranean colony of Italy, ought to be capable of cotton growing where irrigation is available, but here also everything is still in the uncertain future.

Eritrea.

The importance of Eritrea lies not so much in the quantity produced, which is relatively small, but rather in its fine quality. The Society for the Cultivation of Cotton in Eritrea was founded at Milan in 1903, and has devoted its attention chiefly to the development of two districts. These lie in the upper reaches of two rivers, the Khor Baraka, which also waters the Tokar cotton-fields in the Sudan, and the River Gash, which serves the same purpose in the Sudan province of Kassala. These districts being very far inland, and railway communication being almost non-existent, the usual difficulties of transport are here experienced even more than in the other parts of Africa we have been dealing with. The machinery for the erection of the ginning plant at Agordat, for example, had to be carried inland on camel-back, while the crop has often to be carried over 100 miles by camels to the nearest ginnery. Nothing but the superior quality of the cotton which can be grown could possibly have rendered cotton growing under these conditions profitable. The cotton at first grown was

Transport by Camel.

even to the extent, in certain districts, of compelling every native hut-owner to plant at least one acre.

Varieties Grown.

The cotton grown seems to be mostly of the American Upland type, and of a quality rather superior to middling as a rule. Caravonica has also been tried with apparently little success, but Peruvian and several native tree cottons have given better results. Even American Upland has been tried under perennial cultivation, and is said to do better the second year than the first.

East Africa.

In Portuguese East Africa a considerable quantity of cotton has been grown, especially in the district to the north served by the ports of Quilimane and Chinde, and which runs inland as far as Lake Nyasa. Here successful results have been achieved by the Nyasa Company with Egyptian cotton; in the territory of the Mozambique Company, which has its headquarters in Beira, Egyptian, apparently, has not been a success, owing to the lack of irrigation facilities. American long staple varieties seem to be more generally successful, and the tendency now is towards that type exclusively.

At Bompona, on the Zambezi, at its confluence with the Shiré River, and at Chiromo on the latter river, the Zambezi Company, in 1904, began experimenting with cotton cultivation, at first with Egyptian seed. The first attempts were complete failures; but in 1910 the company abandoned Egyptian in favour of Nyasaland Upland seed, and this seems to have been a greater success. The crop in 1913 amounted to about 650 bales.

The statistics in the table on p. 200 of cotton production in Angola and Portuguese East Africa are from

the Customs Returns of exports, supplemented by private reports.* .

Railways.

The railway development of the southern part of Portuguese East Africa is mainly due to its transit trade—viz., from Lorenzo Marques into the Transvaal and from Beira into Rhodesia. The proposed line from Beira to the Zambezi, probably at Sena, connecting ultimately with the Shiré Highlands line, has already been referred to. It is also reported that a line from Quilimane, on the coast above Chinde, to Port Herald on the Shiré River, has been authorized.

Portuguese Guinea.

There is also some cotton grown in the Portuguese Guinea Colony, above referred to, which occupies the valley of the Rio Grande on the West Coast, but the total amount is trifling.

Belgium.

Belgian Congo.

In the Congo Free State Belgium possesses a country of enormous size (1,000,000 square miles), large parts of which ought to be capable of growing cotton. Various experimental attempts have been made in different parts of the state, particularly in the Lower Congo, near the sea, and also in the Upper Congo, where everything seems favourable but for the lack of transport. The kinds of cotton grown were mostly Egyptian at first, but Upland and Sea Island were also tried, and Caravonica, but the latter was apparently a failure. Experiments have also been made with a

* See "Contribution pour l'Étude des Cotons des Colonies Portugaises," by Prof. C. de Mello Geraldes. Int. Cong. Trop. Agric., 1914.

native cotton, which seems more hopeful. So far, however, the yield obtained has barely covered the expenditure of the government in promoting the industry.* It seems that, as elsewhere in Africa, if cotton growing is to be a success in the Congo, it will only be as a native industry, European planters being greatly hampered by the impossibility of getting a sufficient labour-supply.

Rail and River.

The development of communications in such an enormous area would have been an almost impossible task had it not been for the river, of which 6,800 miles are navigable. It was only necessary to carry the railway from the coast to Leopoldville, on Stanley Pool (250 miles), and again a short stretch of 80 miles from Stanleyville past the Stanley Falls to Ponthierville. Here again the river is navigable to Kindu, from which there is a railway section of 220 miles to Kongolo, near Kabalo. The line from the latter point down the Lukuga Valley to Lake Tanganyika has already been mentioned. From Kabalo, again, the river is navigable to Bukamo, to which point the Cape-to-Cairo Railway is now almost completed.

Summary for all Africa.

Summing up now the results of these three chapters on the development of new cotton-growing areas in Africa, it is at first sight rather disappointing to find from the table on p. 200 that the total output of all these pioneer areas in 1913 was only about 70,000 bales of 500 pounds. This, of course, does not include Egypt, but it does include the Sudan, for though the development of the

* In 1913 a new series of experiments was begun with the assistance of the British Cotton Growing Association.

latter was not primarily the work of the British Cotton Growing Association, that body, as well as the International Federation, has done a great deal to encourage it. But those who are inclined to deride the smallness of the aggregate result from the expenditure of so much money and energy by all the European Associations must remember that these efforts have been dissipated over practically the whole African Continent, and that inevitably so, because the prime object of the work was experimental, namely, to find out where cotton could be grown. As the result of that work it has now become apparent that certain areas are pre-eminently suitable; and the next step in their development is in almost every case the same, viz., the expenditure of very large sums of capital on the construction of railways or other means of communication, for transport is always the limiting factor in Africa. That such expenditure will be profitable, not only as regards cotton growing and the development of other economic crops, but also in the general advancement in civilization of the natives of the countries concerned, has been put beyond all doubt. That is no small result for ten years' work; and it may safely be said that if the necessary funds for opening up these countries are forthcoming, the next ten years will see a very marked increase in the rate of development of Africa. There can hardly be any question that Africa is one of the countries of the future for cotton growing, though India will probably exceed her figures of production for many years to come. But all the work and expenditure of these ten years are justified by the fact now clearly established, that in course of time the world can, *if*

AFRICAN COTTON CROPS

	1902.	1903.	1904.	1905.	1906.	1907.
British (in bales of 400 lbs.):						
West Africa—						
Gambia	—	50	100	300	—	—
Sierra Leone ..	—	50	100	200	150	100
Gold Coast	—	50	150	200	200	250
Lagos	25	500	2,000	3,200	6,000	9,500
Nigeria (Southern) ..	—	50	100	150	150	250
Nigeria (Northern) ..	—	50	100	500	1,000	1,500
Total	25	750	2,550	4,550	7,500	11,600
East and South—						
Uganda ..					500	2,000
British East Africa	—	150	850	2,000	200	200
Nyasaland ..					2,200	2,500
Rhodesia	—	—	—	—	100	200
South Africa ..	—	—	4	24	55	60
Total	—	150	854	2,024	3,055	4,960
Sudan—	300	2,000	3,500	4,000	4,063	7,773
Total British ..	325	2,900	6,904	10,574	14,618	24,333
Equivalent in 500-lb. bales	260	2,360	5,523	8,460	11,694	19,466
Others (in 500-lb. bales):						
German—						
Togoland	88	141	476	589	851	1,237
East Africa	2	41	545	831	830	1,019
Total German ..	90	182	1,021	1,420	1,681	2,256
French—						
Algeria and Tunis ..	—	—	—	14	54	140
Senegal	—	—	—	20	65	44
Upper Senegal and Niger						177
Ivory Coast	—	—	—	—	—	—
Dahomey	—	—	—	45	148	402
Somaliland, Madagascar, and Réunion ..	—	—	—	6	—	—
Total French ..	—	—	—	85	267	763
Portuguese—						
Angola	226	151	564	471	251	413
East Africa	—	—	—	310	188	241
Total Portuguese:	226	151	564	781	439	654
Italian—						
Eritrea	—	—	—	453	1,260	2,339
GRAND TOTALS ..	576	2,693	7,108	11,199	15,341	25,478

EXCEPT EGYPT).

1908.	1909.	1910.	1911.	1912.	1913.	1914. (*Estimates*)
—	—	—	—	—	—	
—	—	—	—	—	—	
200	200	100	100	120	100	
5,500	12,100	5,900	5,800	8,900	14,000	*14,000*
200	300	300	300	270	200	
500	400	400	600	2,600	2,000	*1,000*
6,400	13,000	6,700	6,800	11,890	16,300	
4,000	5,000	12,000	20,000	29,000	26,000	*45,000*
300	300	400	500	900	1,000	
2,100	2,800	3,000	5,000	6,800	6,800	
300	400	400	300	400	700	
114	190	109	88	80	100	
6,814	8,690	15,909	25,888	37,180	34,600	
9,540	6,890	15,370	21,907	14,487	12,830	
22,754	28,580	37,979	54,595	63,557	62,730	
18,203	22,864	30,383	43,676	50,846	50,184	
844	2,247	2,044	2,277	2,424	2,215	
189	2,284	2,740	4,754	8,279	9,644	
3,033	4,531	4,784	7,031	10,703	11,859	
66	198	660	*700*	792	528	
4	26	53	*75*	88	34	
77	154	189	*300*	*440*	435	
—	—	1	—	—	175	
60	600	537	*550*	550	772	
51	18	3	—	24	—	
658	996	1,443	*1,625*	1,894	1,944	
26	341	635	547	428	761	
1	303	292	444	655	2,056	
687	644	927	991	1.083	2,817	
1,683	2,584	3,978	4,873	2,018	*880	
24,264	31,619	41,515	58,196	66,544	67,684	

necessary, find a supply of cotton in Africa which would make it independent of any one other country. America's supremacy is not threatened for perhaps the lifetime of the present generation; but if the conditions there are not progressively improved to meet the world's demand for cotton, there is in Africa as well as in India a possible alternative. It is only a question of whether and how soon it will pay the world to spend the necessary money on the development of Africa. And the answer to that question lies with America herself. Let her remember that in Africa there are 12,000,000 square miles of territory, nearly all of it within the climatic limits of the possibility of cotton growing.

REFERENCES.

Papers on cotton growing in all the European colonies in Africa will be found in the Reports of the Congresses of the International Cotton Federation—viz., Zurich (1904), Manchester (1905), Bremen (1906), Vienna (1907), Paris (1908), Milan (1909), Brussels (1910), Barcelona (1911), and Scheveningen (1913), and the special Report on Egypt and the Sudan (see Chapter XV.) in 1912.

Report of the Third International Congress on Tropical Agriculture. 1914. Papers on German, French, Belgian, Portuguese, and Italian Colonies in Africa.

Reports of the various European Colonial Associations.

Consular Reports.

CHAPTER XII

SOUTH AMERICA

Colombia and Venezuela—Guiana, British, French, and Dutch—Brazil: Cotton growing in early times: Modern depression and recent revival: Local industries: High yields of cotton: Climate and labour: Future possibilities—Peru: Egyptian conditions, river valleys and irrigation: Chief varieties: Prospects—The Argentine Republic—Paraguay, Uruguay and Chile.

THE only two countries in this great continent that are as yet of any importance in the world's cotton-supply are Brazil and Peru; but before going on to deal with these in detail, reference may be made to several others, especially towards the north, in which the question has been taken up on a small scale. Thus, in Colombia and Venezuela, there is apparently a considerable amount of cotton grown; but very little is known of it in Europe, because, as in so many other countries nowadays, there are local mills which take practically the whole of the native crop. In La Guaira, for instance, there were in 1912 three factories at work which could hardly get sufficient raw material in the country to supply their own requirements; and the establishment of a new factory in another part of the district was said to have given quite an impetus to cotton planting in the neighbourhood. Cotton growing and spinning therefore bid fair to become quite a profitable

Venezuela.

industry in the country, but there is no likelihood of any material quantity of raw cotton becoming available for export. The value of the exports from La Guaira in 1912-13 was returned as £2,600 (say, 200 bales), of which more than half went to Germany. In Colombia it is said that cotton cultivation could easily be developed on the eastern plains of the Republic; but no information is obtainable as to what has actually been done, except that the U.S.A. Department of Agriculture, in the Year-book statistics, gives the total crop of Colombia and Venezuela as 5,000 bales. Jones's "Handbook" calls it 10,000.

In the Guianas, British, French and Dutch, there have been various attempts to develop cotton growing, for which there is little doubt that considerable areas are suitable; but none of them seems to have made much progress.

British Guiana.

During the earlier years of the nineteenth century cotton formed a very important part of the exports of British Guiana, 16,000 bales being reported as sent out from the colony in 1827. From that year, however, a steady decline set in, the last recorded export in commercial quantity being twenty-four bales in 1843. During the American War attempts were made to revive the industry, but these lapsed on the return to normal prices after the war. Since then several more or less half-hearted attempts have been made, but have proved unsuccessful. A considerable quantity of cotton is probably grown, partly wild and partly under cultivation by the native Indians in the interior, who use it in the manufacture of hammocks.

In certain districts part of the land along the coast on which cotton was formerly grown has been washed away

through erosion by the sea, but in other districts there are still large areas of land more or less suitable for tree cottons. Practically all the experiments made with Sea Island, Egyptian, and American cottons have failed owing to the unsuitability of the soil and the meteorological conditions of the seaboard of the colony, the yield apparently being very small. Even Caravonica, which gave a much better yield than the herbaceous types, was not found profitable. Attention has since been directed to the production of a suitable type by crossing the native cotton with Sea Island, but no commercial results seem yet to have been attained. There is plenty of suitable land available, but the labour-supply seems to be no more than sufficient for the existing industries.

French Guiana.

In French Guiana the Colonial Cotton Association has given every assistance, and has sent out gins, etc., but no material results seem to have been attained.

Surinam.

In Surinam, or Dutch Guiana, cotton cultivation was of importance many years ago,* but decreased after 1863, on account of the abolition of the slave trade, combined, no doubt, with the heavy fall of prices after the American War. A few years ago efforts were made to reintroduce cotton growing, and apparently with some success, but no details or statistics are available.

Curaçoa.

The Dutch Island of Curaçoa, lying off the coast of Venezuela, also produces a little cotton, but no definite information is available as to the quality, quantity, or prospects of the crop.

* See footnote, p. 97, and Baines' "History of the Cotton Manufacture," p. 305.

Brazil.

It is difficult to get reliable information with regard to the actual situation and possible future developments of Brazil, but it seems to be a country of great possibilities and relatively poor achievements. Cotton has been cultivated in Brazil from very early times; it is said to have been found growing there by the Portuguese when they first landed in the country in 1500. It was first introduced into England in 1781,* and it was our chief source of supply till 1800. As in other countries, the industry expanded greatly during the American Civil War, but suffered a relapse when peace was restored. During the period of low prices in the '90's it declined still further, but has recently revived again. At one time very considerable quantities were exported; the record figure of 346,231 bales is quoted in 1872, but within the last twenty years local cotton factories have been set up throughout the country in large numbers. There were said to be 190 of them in 1911; the spindleage is now estimated at 1,000,000, and, as will be seen from the table on p. 220, the greater proportion of the crop is consumed in these mills. This tendency is further encouraged by the imposition of an import duty of 7·27 cents per pound on foreign cotton, and most of the states also impose export duties on raw cotton of from 8 to 12 per cent. of its value. The result is that the statistics of export of Brazilian cotton, which comes mostly to Liverpool, are now very little indication

Ancient Times.

Local Manufactures.

Tariff.

Exports and Crop.

* See Baines p. 305

of the total volume of the crop, which can only be roughly estimated. The cotton exported is mostly of the long staple varieties, the short staple being used by the local industry.

It is still more difficult to get any statistics at all with regard to the area at present under cotton, or which might be available for cotton growing in future. It seems to be widely spread, however, over many different provinces, and to include areas offering markedly different conditions, so that entirely different types of cotton are grown. Thus in one state alone, São Paulo, three different kinds of cotton are reported—Upland in the southern and western districts, several varieties of Egyptian in the northern districts, and Sea Island in the maritime zone. In this state the Department of Agriculture is endeavouring to encourage the extended cultivation of cotton, and has sent representatives to the United States to study the subject. The area under cotton in this state alone was reported as 15,000 acres in 1910,* and the annual output about 8,500 tons, equal to about 38,000 bales of 500 pounds, or fully 1,250 pounds per acre, whether of seed cotton or lint is not stated. Another Consular Report† from the same source states that—" In many parts of the state the yield of cotton ranges between 1,500 and 3,000 kilos per hectare" (equal to about 1,350 to 2,700 pounds per acre), "whereas the average yield in the United States does not exceed 900 to 1,000 kilos per hectare" (810 to 900 pounds per acre). The American comparison indicates that seed cotton is here intended,

Area.

São Paulo.

* Consular Report, No. 4,700. † No. 4,900.

though the figures last quoted, allowing the usual ginning out-turn of one-third lint, are at least 30 per cent. too high. If the consul's figures are to be taken literally—and they are supported by other authorities—São Paulo ought to be one of the finest cotton-growing countries in the world, for the yield of 450 to 900 pounds of lint per acre is hardly excelled even by Egypt.

High Yields.

Cotton is also raised in nearly all the states round the coast of Brazil, from near the mouth of the Amazon along the north-east coast to Pernambuco, and south to São Paulo. Pernambuco produces nearly one-third of the whole crop; then follow Parahyba, Rio Grande do Norte, São Paulo, Maranhao, Minas Geraes, Sergipe and Bahia, Alagoas and Ceara. The following table gives an approximate idea of the produce of each state, and how it is disposed of. The figures are taken from a paper prepared by Dr. E. L. Voss for the International Cotton Federation, and represent the average of the years 1900 to 1910. The states are given in geographical order, from north to south:

Other States.

In Bales of 250 Kilos = 550 Pounds.

State.	Total Crop.	Home Consumption.	Exports.
Maranhao	32,000	16,000	16,000
Ceara	16,000	8,000	8,000
Rio Grande do Norte ..	36,200	33,200	3,000
Parahyba	41,000	25,000	16,000
Pernambuco	94,000	58,000	36,000
Alagoas	16,400	8,400	8,000
Sergipe and Bahia ..	16,800	16,800	—
Minas Geraes	21,200	21,200	—
São Paulo	32,000	32,000	—
Totals	305,600	218,600	87,000

bulk of the cotton is raised, frequently suffer from prolonged drought, so severe as often to cause actual famine —in Ceara, for example. The cotton-growing season varies greatly in different parts of the country. Thus, planting begins as early as the middle of December in some districts, and goes on to the end of May in others, while in the same way the picking season extends from July to February. There are a few large plantations; but most of the growers are small farmers, and the labour-supply is not always sufficient. The rubber boom drew away a great deal of labour for a time, especially from Ceara, to the forests of the Amazon. Slavery was only abolished in 1888 in Northern Brazil, and the country seems to be still suffering from the effects. Political conditions have also been very unsatisfactory, with the usual effect on capital and on the economic development of the country generally. Wages are low. The *highest* rate quoted by one authority for pickers' wages is only 6s. 4d. per 100 kilos of lint, equal to about 1s. per 100 pounds of seed cotton; and day wages are about 1s. 6d.; yet the cost of living is high. The methods of cultivation in general use are very primitive. Agricultural machinery is practically unknown, as also is the use of fertilizers, drainage, or the scientific rotation of crops.

Labour.

Two different varieties of cotton seem to be chiefly grown: the first is a tree cotton known as Creoulo or Maranhao cotton, which is said to yield well for two or three years (one report says ten to twelve years), and to bear open bolls almost all the year round. The lint of this tree cotton is said to be of

Tree Cotton.

very good quality, though the yield is less than that of the herbacequs variety, which is more extensively cultivated. The tree cotton, however, is said to be more drought-resisting. Its bolls are large, but have a close-growing habit, so that the cotton when ripe does not protrude, giving rise to increased cost in picking. This tree cotton is said to enjoy a wonderful immunity from insect pests. The other is the ordinary short-stapled herbaceous cotton, and is called by that name, "Herbaceo." It is chiefly grown in the coastal districts, where the rainfall is more reliable.

Herbaceo.

The lint from these two species of cotton varies greatly in quality, the staple being sometimes as short as $\frac{3}{4}$ inch, while some growths give as much as $1\frac{1}{2}$ inch staple, but the average is about 1 inch to $1\frac{1}{4}$ inch. The careless mixture of different staples is almost universal. The general character of the staple is good, and it possesses a peculiar harsh or wiry character, which makes it specially suitable for mixing with wool. It is generally badly handled in picking and ginning, and only saw-gins are used. The usual weight of a bale is only about 250 pounds, though those exported are often more.

Communications.

Natural transport facilities are good, there being a great many rivers which are navigable for a large part of the year. In proportion to the enormous area of the country there has been very little railway development; but there is said to be plenty of land still unoccupied within reach of the existing railways and the rivers. According to Dr. Voss, in the area at present opened up and provided with communications in North Brazil alone, of over thirty million

acres available for cótton, less than half a million are actually growing cotton.

The general result seems to be that while Brazil is undoubtedly capable of producing large quantities of good staple cotton, there is no immediate prospect of it becoming the source of any greatly increased supply of cotton for European consumption. Capital and, worst of all, initiative, are lacking; the labour-supply is unsatisfactory, and there is a general lack of modern methods, both as to cultivation and seed selection, which renders the present extent of cultivated land much less productive than it ought to be. Brazil, it seems, might easily grow a crop of twenty million bales, but her actual crop does not yet reach half a million.

Prospects.

Peru.

Coming now to the west coast of South America, the conditions in Peru are markedly different in almost every respect from those in Brazil described above. Here cotton is grown entirely under irrigation, as the climate is practically rainless, except in the North, where torrential rain sometimes falls in summer; and only the lack of funds to carry out further irrigation works prevents the development of cotton growing on a more extensive scale than at present.

Peru owes its special advantages for cotton growing to the exceptional physical and climatic characteristics of the country. Its coast-line extends about 1,200 miles, from 3° south of the Equator to 22°. It consists chiefly of arid sand-hills, but these are intersected by numerous valleys, varying

Physical Character.

in length from 25 to 100 miles, running from the Andes to the sea, and each is the bed of a river, which has filled it with a rich deep alluvial soil. During the hottest months, which constitute the cotton-growing season, the volume of these rivers is augmented by the melting of the snow in the mountains, and, as the slope of the valleys is as a rule fairly steep, irrigation is a comparatively simple matter, and every part of the valley can be conveniently watered.

The climate is not excessively hot, owing to the Humboldt current, which comes from the south and washes the Peruvian coast, thus modifying the temperature and making it fairly uniform during the year. The mean annual temperature of the coast provinces is 68° Fahrenheit, while in the hottest months it is between 8.° and 86°. The country is free from hurricanes, storms, or sudden and violent changes of temperature. In some parts of the country the climate is so uniform that sowing can be done at any time of the year. The usual sowing time, however, is in October and November, and picking begins in May or June. Finally, as many of these valleys in which the cotton is grown are situated near the coast, the cost of transport is relatively small. Most of them are supplied with railways, terminating at seaports with good harbours; the only difficulty is the heavy surf which prevails occasionally during the cotton harvest season (June to August), and retards the loading of the steamers.

Climate.

Transport.

The cotton estates vary in size from 500 to 5,000 acres, and are owned principally by Peruvians. The labourers

are mostly native Indians, who are on the whole fairly efficient; but there are complaints of the scarcity of labour, and the average wage, about 2s. 6d. per day, is only exceeded by the United States (and perhaps Russia) among all the cotton-growing countries of the world. During recent years there has been some immigration of Chinese and Japanese labourers, but they are said to have proved less satisfactory than the native Indians, who are described as of good physique and very steady and persistent workers. On some of the larger estates part of the land is let to the natives in small holdings on some kind of crop-sharing system, which is said to give better results than ordinary wage labour, especially where labour is scarce, as the workmen look after their own crops with greater interest and care than they do when only wage-earners. Owing to the insufficiency of capital, the agricultural implements in use on most of the estates, are rather primitive; steam ploughs and other modern implements are known only on the larger and most advanced estates. An important factor in the agricultural system is the proximity of guano deposits in the small islands off the coast. This natural fertilizer can be had for the mere cost of digging and transport, which amounts to about 35s. per ton, and when used on land which has been impoverished by many years of continuous cultivation it produces excellent results. Most of the larger estates have their own ginning plant, and they also gin and press the cotton of the smaller farms in exchange for the cotton seed, which is said to be worth about £5 per ton. Some of the

Labour.

Methods.

Ginning.

ginneries also crush the seed, and there is a local soap industry to utilize the oil.

The varieties of cotton chiefly cultivated in Peru are four in number:

Smooth Peruvian.

1. About 65 per cent. of the crop consists of a staple known as Smooth Peruvian, which is sometimes called Smooth Egyptian, though other writers speak of it as Upland cotton. The staple is not long, under 1¼ inches, but it is strong and of good colour, and "good fair" cotton of this type commands a premium in Liverpool of about 60 to 80 points on American middling. It is generally grown as a biennial, the average yield per acre for the first year being about 500 pounds, and for the second about 350 pounds, which, however, is sufficient to cover the relatively small cost of cultivation in the second year. The ginning out-turn is given as 31 per cent.

Rough Peruvian.

2. Rough Peruvian comes next in importance, and accounts for about 30 per cent. of the total crop. It is an indigenous plant (*G. Peruvianum*), and is grown principally in the more northern valleys, where the heat is greatest, and there is some rain. It is a perennial cotton, growing to a height of 8 to 10 feet, and may live as long as twenty years, but it is usual to replant after the fourth crop. The methods of cultivation are peculiar, and the sowing and picking seasons quite different from the other varieties. There is always cotton ready to be picked, but the two chief seasons are June to October and December to March. The staple is long, about 1¼ inches to 1½ inches, and, like Brazilian, this cotton is used largely for mixing

with wool, from which it is said it can hardly be distinguished. This is probably why the price moves in such a peculiar way, apparently quite independently of the price of American. This, as will be seen from the diagram on pp. 442, 443, has been exceedingly marked since the War. The price of "good fair" cotton of this type is generally about 1d. to 1¼d. above that of American middling.

Sea Island.

3. A small quantity of Sea Island cotton is grown, but of inferior quality, if one may judge from the price in Liverpool, which is generally below that of Florida and Georgia cotton. It is said, however, to be capable of great improvement in quality, though Egyptian experience seems to limit the possibility of real success with Sea Island in an otherwise dry climate to those districts which are very near the sea.

Peruvian Afifi.

4. In recent years a small but increasing quantity of Egyptian Mitafifi cotton from imported seed has been grown in Peru with considerable success, and has commanded a price equal to that of the Sea Island type of Peruvian. The price in Liverpool of "good fair" Peruvian Afifi is sometimes nearly 1d. higher than the same grade of Egyptian.

Pests.

Cotton in Peru seems to be remarkably free from pests, though in recent years an insect called *Piojo blanco* has made its appearance among the rough Peruvian tree cotton, and has done considerable damage. It is said, however, that this pest does not make its appearance for some time after re-sowing, so that it may be found possible to get rid of it by more frequent replanting. An interesting comparison

table on p. 220, about 90 per cent. of the crop is exported, the internal consumption being very small. For 1913 the total crop is stated at figures as far apart as 110,000 and 176,000 bales. No complete statistics of the area and yield are available, but the area was given as 148,000 acres in 1910, and the yield is said to average about 500 lbs. of lint per acre on the better plantations, which is as good as the Egyptian average. It is said that experiments have proved that as much as 800 lbs. of Egyptian lint per acre can be obtained, and nearly 1,000 lbs. of the short stapled smooth Peruvian. This is quite consistent with the facts in Egypt, where, under ideal conditions, a yield of 1,200 lbs. per acre has been attained. The Peruvian Government seems to be taking an active interest in the improvement of the crop, and has established an experimental station near Lima. The planters are described as intelligent and progressive, and eager to utilize the latest information obtainable as to cotton growing.

High Yields.

ARGENTINE.

There is probably no country in the world where the *possibilities* of cotton growing are greater than in the Argentine Republic. The soil is fertile, and large areas of land are suitable for cotton cultivation. The rainfall is ample, and experiments already made on a small scale have proved that the yield and quality of the cotton would, under proper cultivation, be very high. Unfortunately, the development of these possibilities into actualities is unlikely in the meantime, chiefly on account of the lack of sufficient labour. In certain districts, mostly in

the north, and particularly in the Chaco territory, a considerable amount of cotton has already been grown by European planters, employing native Indian labour or peons, who apparently come from considerable distances at picking time to assist in this and the other harvests. The results seem to be highly satisfactory as far as they go. Samples seen at the International Congress of Tropical Agriculture in London, in 1914, seemed to be of at least two different varieties, resembling American and Peruvian respectively, but the condition of most of them left much to be desired, being indeed just such as might be expected under primitive conditions of picking and handling. A good deal of Egyptian cotton is also grown. Remarkable figures are given of the alleged yield—1,500 kilos. of seed cotton per hectare, which is equal to about 500 lbs. of lint per acre. In view of the figures given above for Brazil and Peru, there is no apparent reason why this should not be true; but if such figures can be realized in a country which is only an amateur in cotton growing—the total crop so far does not exceed 5,000 bales—there is no saying what might be done under more mature conditions. It is to be feared, however, that any serious development of cotton growing in the Argentine would very quickly raise the labour difficulty in an acute form. In fact, the worst of the Argentine, from our point of view, is that it grows so many other profitable crops that cotton, with its excessive demand for labour, must inevitably wait till the country is more heavily populated; and that, in view of the enormous area of the Argentine, may not be for a very considerable time yet.

According to American sources, Paraguay is also pro-

ducing a little cotton, presumably in the districts adjoining the Argentine areas, while Uruguay is credited with a new but substantial cotton-growing industry, producing over 10,000 bales in 1913. Chile also is reported as possessing a crop of about 1,000 bales.

South American Cotton Crops (in 500-Lb. Bales).
(See Table A, III., in Appendix for further details.)

Year.	Brazil.		Peru.		Other Crops.	Total.
	Exports.	Mean Estimated Total.	Exports.	Mean Estimated Total.		
1902	141,406	381,000	29,409	36,000	4,000	421,000
1903	124,238	311,000	33,664	42,000	6,000	359,000
1904	58,356	251,000	37,540	64,000	5,000	320,000
1905	105,960	364,000	41,628	58,000	5,000	427,000
1906	139,319	409,000	45,953	59,000	8,000	476,000
1907	123,360	380,000	54,291	73,000	11,000	464,000
1908	156,847	325,000	70,532	79,000	12,000	416,000
1909	43,860	268,000	95,411	94,000	11,000	373,000
1910	49,105	297,000	123,000	93,000	11,000	401,000
1911	64,446	300,000	—	96,000	19,000	415,000
1912	69,405	338,000	—	106,000	21,000	465,000
1913	165,000	426,000	—	142,000	30,000	598,000
1914	—	—	—	—	—	—

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CHAPTER XIII

LONG STAPLE AMERICAN UPLAND

Importance of fine cotton—Egyptian and American—Demand of the American mills—The Yazoo Delta—Boll weevil—Improved early maturing types—New districts—Marketing difficulties—Egyptian cotton in Arizona and California.

THOUGH comparatively small in quantity, this section of the American crop is of special importance on account of its fine quality and high market value. It is now an important item in the raw material of the fine spinning trade, which, so far as Europe was concerned, was, until a few years ago, mainly dependent on the Sea Island and Egyptian cotton crops. Within the last ten years, however, European spinners have been realizing that in addition to Sea Island, the finest cotton of all, America was producing other varieties of cotton intermediate between Upland and Sea Island, which, for many purposes, were almost as good as Egyptian. In fact, the northern mills in the United States had been employing these cottons for purposes very similar to those for which Europe was employing Egyptian for some years before European spinners generally had their attention drawn to the possibilities of the new supply.

Importance to Fine Cotton Trade.

It was not till 1909, however, that the capabilities of

these long staple American varieties were fully realized in Europe. The increasing demand for Egyptian cotton, especially for mercerizing purposes, had raised the price to such a premium as to compel the spinners to seek everywhere for a substitute or an additional supply. The difficulty, however, was that they had little experience of any American cotton (other than Sea Island) which would spin up to high counts. Before 1906-07, 40's were supposed to be about the highest that could be got out of American Upland, at least for twist or warp yarns, in which strength is essential. Again, it was generally accepted that American yarns would not mercerize satisfactorily. But about that time many spinners had been experimenting with superior types of American staple cottons, which under proper treatment produced yarns much better than anything that had hitherto been got from Upland. By combing as well as carding the yarn, which had only been done hitherto with Egyptian and Sea Island yarns, weft yarns as high as 120's had been produced from such long staple cotton, sometimes by mixing it with Egyptian. At the same time, attempts to mercerize these yarns proved sufficiently successful to encourage further experiment. As these long staple cottons (of nearly 1¼ inches staple) could at that time be bought at a premium of about 1½d. to 2d. on American middling, as against 3d. or more for Egyptian cotton, there was every inducement to try the substitution.

Increased Use in Europe.

Improved Methods.

In 1908, lower prices of cotton generally, and especially of the finer grades, made substitution less important,

1. ON THE MISSISSIPPI.

2. A PLANTER'S HOME IN NORTH TEXAS.

and efforts in that direction were somewhat relaxed. In 1909-10, however, the disastrous failure of the Egyptian crop sent it up again to famine prices; and the efforts to replace it by American were renewed with increased vigour and with remarkable success. American mercerized goods were now almost as good as Egyptian, and the new process of "schreinering" opened up entirely new lines of trade for cotton generally, and fine American cotton in particular. Many Bolton spinners, who had used nothing but Egyptian cotton all their lives, found themselves compelled by higher prices to try the new substitute, and were astonished at the success of the result.

Substitution for Egyptian.

It was another matter to persuade the manufacturers and the wholesale buyers to try these fine American yarns and fabrics, especially for mercerizing purposes; but the high price of their former materials provided the strongest possible inducement, and they also were rapidly converted.

But no sooner had these difficulties been overcome than the situation again changed. The supply of these American long staple cottons in Liverpool suddenly failed, and the premium demanded for them rose to such a height that they became practically as dear as the Egyptian, at which level they have, on the whole, since remained.

Failure of Supply.

Fortunately, the Egyptian disaster of 1909 has not been repeated, and the supply of fine cotton has been fairly adequate to the demand. But the experience of recent years has shown the capabilities of expansion of the Lancashire trade in fine cotton goods, and it is certain that at anything like reasonable prices England's consumption of fine cotton

would increase very rapidly. The possibility of an increased crop of long staple American cotton is, therefore, a matter of prime importance, especially to Lancashire, where the tendency is all towards finer goods.

Amount of Crop.

It is unfortunate that no statistics at all are available of the amount of this section of the crop. Length of staple is, of course, entirely a matter of degree. In Indian cotton an inch is long staple; in Sea Island anything under $1\frac{1}{2}$ inches would be short. In Upland anything with a staple of $1\frac{1}{8}$ inches or above it commands a premium as staple cotton, but the old Peelers and other Delta staples ran to $1\frac{1}{2}$ inches. It is, therefore, difficult to lay down any hard and fast limit for what should be classed as long staple American Upland; but on the basis of $1\frac{1}{2}$ inches* as the minimum it is estimated that the total crop is probably under 200,000 bales per annum. If $1\frac{1}{4}$ inches be taken, the estimate would probably be double that figure.

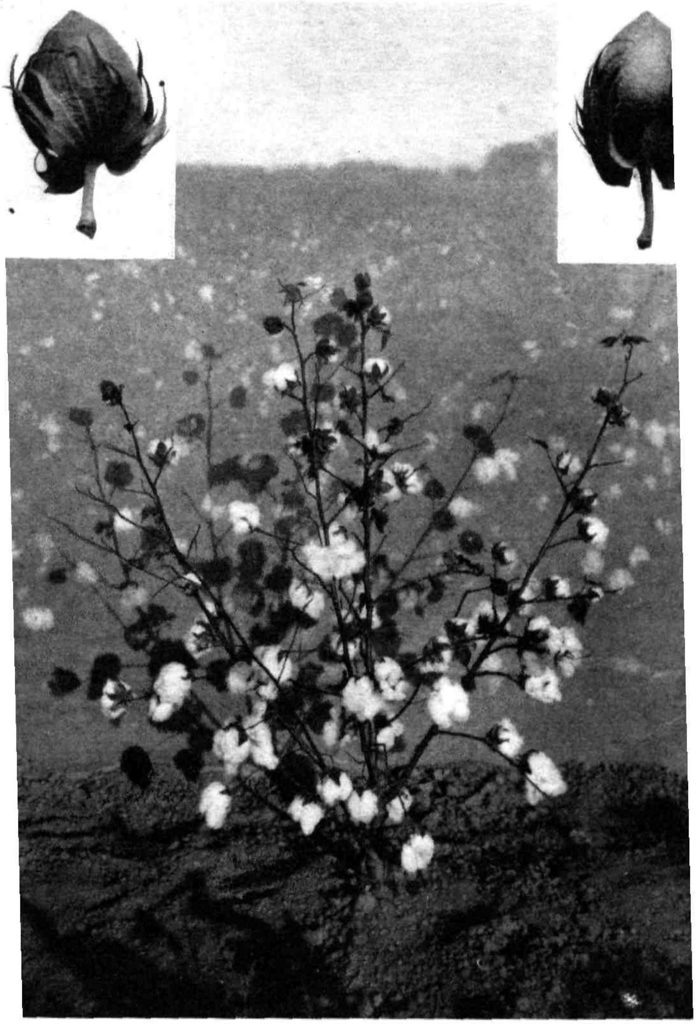
Original Area.

The chief source of supply of the old Delta staple cottons is the Yazoo and Mississippi Delta, and the adjoining portions of Arkansas on the west bank of the Mississippi. Extending from a little below Memphis, the trading centre of the district, to, say, Vicksburg, where the Yazoo joins the Mississippi from the east, there is a narrow strip of about 200 miles in length of extraordinary fertility, which presents almost ideal conditions for rain-grown cotton. For the opinion is now more generally held, though

* Again, it must be remembered that the measurement of length of staple varies greatly. Thus, staple which a scientific breeder would call $1\frac{3}{8}$ or $1\frac{7}{16}$ inches would probably pass in Liverpool as "commercial" $1\frac{1}{2}$ inches.

1. THE FIRST YEAR'S CROP, MISSISSIPPI.

2. CLEARING OLD LUMBER LANDS FOR COTTON.



DURANGO COTTON PLANT IN CALIFORNIA, WITH LEAVES REMOVED TO SHOW BRANCHING HABITS. *Insets.* DURANGO BOLLS.

From U.S.A. Department of Agriculture's Circular, No. 111.

experts still differ, that these long staple cottons, which have been produced in this district for many years, are not a different species of cotton—as Sea Island is, for example—but are simply selected varieties of American Upland. Grown on good soil, with a suitable climate, proper methods of cultivation, and care in seed selection, they produced cotton of 1½ inches staple, and there was no reason to believe that the limits of such improvement had been reached. The best known of the older types of Peelers, Rivers, and Benders (the latter so called because they were originally grown in the rich soil forming the bends of the river), such as Allen, Griffin, Sunflower, etc., found a ready market at remunerative prices. The labour-supply in this district has always been less of a difficulty than in Texas, and there are large areas of land at present under heavy timber or lying practically waste in marsh or scrub which are rapidly being brought under cotton cultivation.

Boll Weevil.

Unfortunately, however, the advent of boll weevil to the district about 1909 proved disastrous to these superior cottons, for the old types were very late maturing, and practically the whole of the crop was at the mercy of the pest on its appearance in full strength in early autumn. The result was that at the first hint of the approach of the boll weevil to the district, most of the planters threw over the long staple types, and went back to the earlier maturing Upland varieties, of comparatively short staple, say 1⅛ inches, and in many cases even an inch or less.

There were, indeed, many of the planters who were not at all averse to making such a change, even apart from

the boll weevil, for it was the generally accepted opinion that these long staple varieties were more troublesome to grow, and gave a lower average yield, so that, unless a good premium could be obtained for staple, the cheaper varieties really paid the farmer better. The combined result, therefore, is that $1\frac{1}{2}$ inches staple cotton of the old Delta types is now hardly to be found, even in the northern parts of the district, where the frosts in winter are sufficiently severe to kill the boll weevil in its hibernating quarters, and so prevent the pest from becoming serious. It is said that a temperature of 24 degrees above zero (Fahrenheit)—*i.e.*, 8 degrees of frost—will kill all unprotected boll weevils, and that 4 degrees lower will reach even those in the snuggest winter quarters. On the other hand, however, the farther north one goes, the possibility of an early killing frost becomes greater, and this may reduce the yield of a late maturing variety almost as much as the boll weevil, by killing the top crop.

New Varieties.

As no method has yet been discovered of getting rid of the boll weevil, the only hope seemed to be to evade it partially at least by the introduction of early maturing varieties; but, unfortunately, it was also commonly accepted that early maturity was incompatible with long staple, which required the long period of growth to mature it. Fortunately, however, the scientific authorities of the Bureau of Plant Industry in the Federal Department of Agriculture at Washington were not of the popular opinion that long staple necessarily means low yield and late maturity. Certain new types of short staple Upland cotton, such as Mexican Big Boll, seemed to offer possibilities of heavy

1. MEXICAN COTTON GROWERS' SHACKS IN SOUTH-WEST TEXAS.
2. STAPLE COTTON, NEAR SAN ANTONIO, TEXAS.

yield and early maturity, combined with a staple which, though not so long as the old types, might easily be raised well over an inch in length. By persistent and careful experiment and selection, these hopes have now been practically realized. Webber, Columbia, Durango (bred out of a single boll from a town of that name in Mexico, found in an exhibition sample at St. Louis in 1904), Foster, Hartsville, and many others, have been produced partly by selection and partly by crossing of short and long staple varieties, and are steadily pushing upwards the limit of length of staple, which now seems possible. One and a quarter inches has been attained in many cases, and exceeded in others, and it does not seem over sanguine to hope that the old figure of 1½ inches may soon be reached; indeed, it is said that a considerable amount of that length was produced round Clarksville, in North Texas, in 1913.

Possible Extension of the Delta.

The next question relates to the possibility of extension of the area available for the growing of such improved cottons, and on this point the evidence available points to a very hopeful future. The original long staple area has nothing like reached its limits; large sections of it have only recently been cleared of heavy timber, and are now being broken into cotton. The transformation of such areas from what would in England be regarded as well-wooded country—for nothing under 8 inches diameter is worth the attention of the lumber-man—to a field of excellent cotton, dotted over with the blackened trunks of dead trees, which have withstood the fire after clearing, is simply astonishing, and many thousands of

acres still remain to be so treated. Again, there are large areas of marshy land which are now being drained, thus serving not only to increase the area available for cotton, but also to improve the health of the whole district by removing the breeding-grounds of the malarial mosquito, and incidentally also the hibernating quarters of the boll weevil. It is probably well within the mark, therefore, to say that the long staple area in the Mississippi Valley could be doubled within the next ten or fifteen years.

Other Areas.

In addition to this, however, it is now proved that there are many districts throughout the Belt suitable for the cultivation of such types of improved staple cotton, for the old idea that the Mississippi Valley possessed a monopoly of such cultivation is completely exploded. All that is necessary is the presence of similar conditions of soil, water-supply, and climate, and it is beyond question that many such areas exist in different parts of the Belt. Thus, in the Red River Valley, in North Texas, several districts are found — near Clarksville and Paris, for example. In South Texas, along the Gulf Coast and near Victoria and San Antonio, there are similar areas where such cultivation has already passed the experimental stage, some of these being partly under irrigation. Again, in the Red Lands of the Tennessee River Valley, in North Alabama, the conditions seem favourable to the cultivation of improved varieties. In the Atlantic States, the pioneer work of Mr. D. R. Coker at Hartsville, South Carolina, shows what can be done by the use of fertilizers and selected seed, even under different soil conditions from those of the river bottoms above referred to.

In all such districts, however, it is very important that an elaborate (and necessarily costly) system of seed-care, if one may coin a phrase, should be established to maintain the purity of the long staple varieties, and prevent their rapid deterioration by mixture with the surrounding short staple cotton. To make this really successful it is essential that practically the whole of one district, which is more or less capable of isolation, should be turned over to the superior type of seed, and such conditions are very difficult to secure in any district situated in the middle of the existing cotton belt. The ideal has, however, been more nearly attained in two entirely new districts, which have been created by irrigation, in the Salt River Valley of Arizona, and the Imperial Valley of South California. In these districts, where the conditions more closely resemble those of Egypt, marked success has already been attained, not only with Durango and other types of long staple Upland cotton, but also with pure Egyptian, especially a variety known as "Yuma," which has been successfully acclimatized.

The South-West.

Egyptian Cotton.

Here, however, a new form of the labour difficulty has arisen. Egyptian cotton, and to a less extent also Durango, shows a peculiar type of boll, very different from the American Upland. The latter when fully ripe opens very wide, allowing the cotton to project freely from the boll, so that it is very easily picked, the whole contents of the four or five locks into which the boll is divided coming away readily in one handful. The Egyptian cotton, however, has a closer in-growing habit, so that each lock requires to be scooped out by a separate

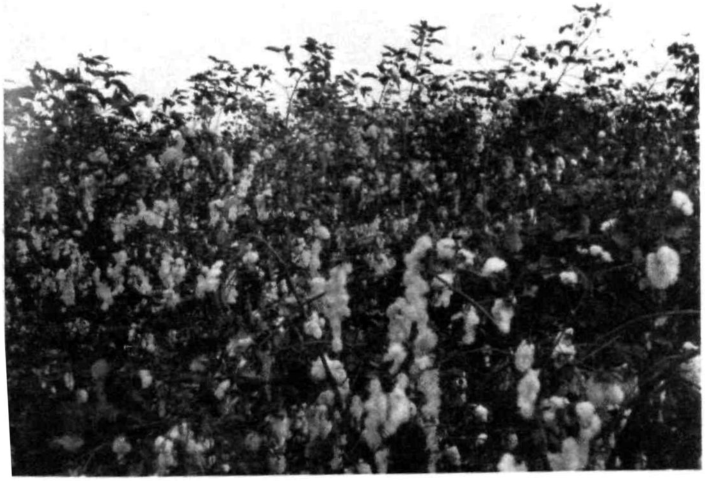
finger, and the bolls are smaller, so that it takes longer to pick a given weight of cotton. The result is that the pickers require to be paid at a much higher rate. In the case of the Yuma variety from 2 to 3½ cents* *per pound* of seed cotton has been paid, and the extra cost thus entailed seems likely to prove a handicap to the extended cultivation of the Egyptian type. To avoid this difficulty in the case of the American long staple types, further new types are being selected which possess all the good qualities of the Durango, with the additional advantage of the open character of the ripe boll, and it is probable that the type finally selected will be developed on these lines.

Cost of Picking.

There is, however, one special difficulty which so far has considerably retarded the development of new long staple areas—namely, that of finding a market for these superior cottons at an adequate premium. The system of marketing the American crop throughout the Belt generally has already been described and its difficulties indicated. These difficulties are aggravated in the case of long staple cotton by the fact that the market for such cotton is necessarily limited, and the total output comparatively small. Only the large export firms are sufficiently in touch with the users of such cotton to have established regular grades of this class, and trained their buyers to be on the look-out for it and know its proper value. But these special buyers cannot possibly cover a large number of small areas scattered throughout the Belt. Hitherto

Marketing Problem.

* Similar cotton costs in Egypt less than 1 cent per pound to pick.



1. EGYPTIAN COTTON BALES IN ARIZONA.

2. THE SAME IN THE FIELD.

From U.S.A. Department of Agriculture's Circular, No. 123.

they have been practically confined to the district served by Memphis—*i.e.*, the Mississippi Valley—and there the system has been thoroughly established. In the new long staple districts, however, buyers of long staple cotton are few and far between, and as the small independent buyers have no proper market for it, there is in many cases an absolute lack of competition, which results in very inadequate prices being offered. Not many of the planters are financially strong enough to ship their cotton direct to Memphis or New Orleans, where its proper value would be recognized. An illustration of the difficulty may be found in a case quoted in a recent government publication, where cotton for which the grower could get no better offer than 9 cents in his own town was forwarded to New Orleans, where it fetched 19 cents.

Apart from this special difficulty in these new districts, the state of the market for long staple cotton seems to have been very irregular in recent years. The large quantity sent to the European spinners in 1909-10 is said to have been the result of a glut in the local markets, which led to a large accumulation of stock in the United States; but the creation of a European demand caused scarcity, and sent the price up again, as already described. Since then the American mills, whose consumption of this class of cotton seems to have been very active, have been taking all the available supply, at first at high prices. But in October, 1912, for some unexplained reason, there seems to have been an absolute slump in long staple values, due in the first place to the collapse of the demand by the American mills; and as the growers,

Recent Price Changes.

owing to the fact that the local demand seemed to have monopolized the supply, were apparently out of touch with the European markets, it became very difficult to dispose of the cotton at anything like a fair price.

American Mills and Lancashire.

The situation thus created presents several features which call for investigation. It is not clear, in the first place, why the American mills should have been able to outbid the Lancashire spinners, as alleged. The difference in the cost of transport can hardly account for it, for the extra cost, if any, of sending cotton to Liverpool, instead of to the Northern States (the Southern States until recently used comparatively little of these staple cottons) is negligible. As a rule, the Lancashire spinners can get fully better results, especially out of good cotton, than any of their competitors throughout the world, and they have always been willing to pay the best price for such cotton. Two explanations were offered to the writer, one being that the American mills, owing to Protection, could afford to pay higher prices for their raw material, and were not so keen buyers as they might be. The threatened reduction of the tariff, however, seems to have caused great alarm, especially among the users of fine cotton in the States, and in anticipation of its effect they cut down their commitments in raw material. Whether these fears are likely to be realized, and the American fine cotton industry seriously injured by English competition, it is still too soon to say. English manufacturers, accustomed to Free Trade, may find it difficult to believe that the lowering of the duty to 15 or 20 per cent. would kill the industry. On the other hand, recent experience of the expansion of the Lancashire trade in fine cotton goods

under the influence of low prices (in marked contrast to the comparative stagnation of the American trade) would seem to show that, if the lowering of the tariff results in an appreciable reduction of the retail price of these goods in America, the increased turnover should more than compensate the manufacturers for a lower rate of profit; but it will take time for this effect to show itself.

American Imports of Egyptian.

The other explanation was that the American spinners were using these long staple cottons where Lancashire is using Egyptian, the consumption of the latter in the United States having been until recently comparatively small. The fact that the imports of Egyptian cotton increased considerably in 1911-12-13 seems to give colour to this view. It is said, however, that many of the American spinners found their first experience of Egyptian cotton very disappointing, and were likely to return to their former material, if it were obtainable at fair prices.*

No Quotations of Staple Cotton.

In any case, the fact apparently remains that the value of long staple cotton tends to fluctuate to an undesirable extent. This is probably due, in part at least, to the lack of any uniform or published quotations for staple cotton. The system of grades of American cotton

* The American *net* imports of cotton from Egypt during the last eight seasons were as follows (in 500-lb. bales):

1905-06 ..	.. 103,669	1909-10 ..	.. 102,217
1906-07 ..	.. 169,731	1910-11 ..	.. 183,786
1907-08 ..	.. 120,187	1911-12 ..	.. 175,835
1908-09 ..	.. 129,985	1912-13 ..	.. 182,238

But the *gross* imports for 1913-14 were only 137,355 bales, against 191,075 for 1912-13 ("Supply and Distribution of Cotton," 1913 and 1914).

(middling, etc.) is based solely on the condition of the cotton as to cleanliness and appearance, and has no reference to length of staple. The extra value of long staple cotton is expressed in " points on " the basis price. Incidentally, this premium has for some time back ruled very high; in Liverpool as much as 5d. or 6d. " on " has been paid. It does seem as if it ought to be possible nowadays to establish a separate system of quotations for staple cotton, just as there is for Egyptian or Sea Island, but the practical difficulties have so far prevented anything of the kind. But under present conditions the result is that the growers, especially in new areas, are seriously discouraged from experimenting with new types, and the development of such new areas is greatly hampered. The only remedy that can be suggested is to bring European consumers more directly into touch with the long staple crop, especially in these new districts.

Lack of Touch with Europe.

If Liverpool cotton-brokers whose connection lies among the possible users of $1\frac{1}{4}$ inch cotton could make a tour of some of these new long staple districts, they would probably find it result in an extension of their business, which would not only be profitable to themselves, but would also be conferring a great benefit on these districts, and indirectly on their own customers among the spinners, for it can hardly be questioned that one of the chief needs of the fine spinning trade at the present moment is the broadening of the basis of supply.

The Federal Department of Agriculture has felt this difficulty, especially with regard to the development of the new irrigated areas in Arizona and California. During

the season of 1913-14 a considerable quantity of the Yuma variety of Egyptian cotton was shipped from Arizona to Liverpool, and it is believed that the results were very satisfactory, not only to the owners of the cotton, but to the spinners who bought it.

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Publications of the various bureaus of the Department of Agriculture and Department of Commerce of the United States Government, dealing with long staple cotton, Egyptian cotton in the South-West, and marketing conditions generally.

CHAPTER XIV

EGYPT

Jumel's discovery and Mohammed Aly—Quality and high prices—Irrigation system—Drainage—Methods of cultivation—Varieties — Deterioration — Ginning and baling — Cotton pests — Statistics.

THE modern history of cotton in Egypt dates from about 1820, when a French-Swiss engineer, called Jumel, discovered a plant growing for decorative purposes in the garden of one Maho Bey in Cairo, which he recognized as cotton of a quality likely to be valuable for commercial purposes. Inspired with the idea of developing cotton growing in Egypt, he succeeded in interesting Mohammed Aly, the founder of the present Egyptian dynasty, in the subject. The new Jumel or Maho cotton, as it was afterwards called, was a perennial or tree cotton, and its cultivation on a large scale was soon shown to be a commercial success. The results encouraged Mohammed Aly in further experiments, and he began to import foreign seed, principally Sea Island and Brazilian. The result has been the gradual development of an annual type of cotton which is distinctly Egyptian, and which, through many different varieties, possesses the special characteristics of length and strength of lint, fine quality, silky texture, and brown colour, which have

Jumel and Mohammed Aly.

given it a very high value, and created for Egyptian cotton its special market.

American War.

The importance of the Egyptian crop as a part of the world's supply was first established during the Civil War in America, when the price of Egyptian cotton rose to an unprecedented level. The highest quoted price known to the writer is 52 dollars per quintal, which probably corresponds to the modern Egyptian "kantar" of 100 pounds. When the war was over, prices, of course, relapsed seriously; but, unlike some other cottons, Egyptian did not entirely lose the position it had gained in Lancashire during the cotton famine. Its quality had been recognized, and its adaptability for special uses led to its continued use.*

Fine Cotton Trade.

It was not until twenty or thirty years later, however, that the improvement of spinning methods rendered possible the production of finer yarns and finer fabrics from cotton than had ever been known since the traditional days of the Dacca muslins of India, and the fine spinning trade in Lancashire began to be of importance. The development of the sewing-cotton trade created a further demand for fine cotton, which the Sea Island supply was unable to meet, and the attention of fine spinners became centred on the Egyptian staple. About the beginning of the present century the revival of the process of mercerizing, in which at first satisfactory results could only be got from Egyptian cotton, still further increased the demand, and the premium of Egyptian cotton over American, which

* For statistics of the early history of the Egyptian crop, see Tables E, I., and F, I., in the Appendix.

up till then had averaged barely 30 per cent., began to mount to higher levels. In spite of every effort to increase the crop, the supply could not keep pace with the demand, and the price rose fairly steadily till the season of 1906-07, when the average price for the season of Fully Good Fair Brown, which is the basis price for Egyptian cotton, was 10·37d., or 63 per cent. above that of American Middling. The crisis of 1907 in America and Egypt affected specially the higher grades of the cotton trade, and the price of Egyptian fell, relatively to American, during the next two seasons. The failure of both American and Egyptian crops in 1909, however, again sent prices soaring, and as the greater failure had been in Egypt, the increase of the price of Egyptian cotton was correspondingly greater. In March, 1910, the price of Fully Good Fair Brown Egyptian touched 16·19d., and the average for the season was 13·12d., or 67 per cent. above the American average, although the latter was the highest recorded since the war. These famine prices were, of course, not maintained; but Egyptian has never lost its position of relative superiority, and still commands a substantial premium over the American staple.* On the whole, it seems that this premium is due not merely to the superior spinning value of the cotton, but also to the greater scarcity of the supply in relation to the demand; and as this is due to the apparent impossibility of increasing the crop fast enough to meet the increase of demand, the question

Recent Prices.

* See Table I. on p. 294, also Table F and Diagram in the Appendix, as to the relative prices of American and Egyptian cotton in modern times.

resolves itself into an examination of the conditions which limit the supply of Egyptian cotton.

As these conditions are mainly dependent on one factor—namely, water-supply—it becomes necessary as the basis of the inquiry to deal first with the question of irrigation. That, again, requires some preliminary account of the geography of the country. The total area of Egypt is over 350,000 square miles, forming a large block, roughly square, in the north-east corner of the map of Africa. Of this, however, only about one-thirtieth part, or 12,026 square miles, can by any possibility be regarded as cultivable land; the remainder is, in the fullest sense of the term, desert. The climate being practically rainless, cultivation is restricted within the narrow limits to which the waters of the Nile can be carried, and as the Nile has not a single tributary in Egypt, the cultivable area is confined to (1) a strip 554 miles in length, but sometimes not much more than a mile in width on either bank, stretching from Assuan to Cairo, and (2) the small fan-shaped Delta of the river, from Cairo to the Mediterranean. Though a considerable quantity of cotton, known as Upper Egyptian or Ashmuni, is grown in the northern half of the narrow river strip, from Assiut* to Cairo, more than three-fourths of the total crop is grown in the Delta, of which a further description is necessary.

Geography.

The Nile.

The Nile Delta, from Cairo to the sea, contains, roughly, 4,000,000 acres, bounded on the west and the east by canals, which mark off the desert from the cultivated land, and on the north by the

The Delta.

* Now even farther south. See Table E, III., in the Appendix.

Mediterranean, along the shore of which lies an almost continuous series of more or less salt lakes. Alexandria, the commercial capital of the country, stands between the sea and Lake Mariut, at the north-west point of the Delta. Next to Lake Mariut, on the east, was Lake Aboukir, now drained and cultivated by the Aboukir Land Company; then come Lake Edku, Lake Borollos, and finally Lake Menzaleh, at the north-east corner of the Delta; at its eastern end lies Port Said, forming the entrance to the Suez Canal. The last three communicate with the sea, which controls their level. Lake Mariut, however, is cut off from the sea, and for drainage purposes its level is maintained by pumping at about 8 feet below sea-level. The sides of the triangle are, roughly, 120 miles in length as the crow flies; while the curving coast-line of the base of the triangle extends for 70 miles along the Mediterranean.

Rainfall.

The whole of Egypt is, from an agricultural point of view, practically rainless. At Alexandria the average annual rainfall is about 8 inches; but at Port Said it is only about 3½ inches; and near Cairo an occasional shower or a few wet days in winter are responsible for an average of about an inch per annum. Upper Egypt south of Cairo is, as nearly as possible, absolutely rainless. In no part of Egypt, therefore, is it possible to grow crops without irrigation; the whole agriculture of the country is dependent on the Nile which made it, both literally and figuratively.

Ten miles below Cairo the Nile divides into two main channels, known as the Rosetta and Damietta branches, with their respective mouths on the Mediterranean at

these two ports; at the point of bifurcation stands the great regulator, or weir, known as the Delta Barrage, from above which a system of main irrigation canals strikes off, north-west following the left or west bank of the Rosetta branch, north between the two branches, and north-east towards Port Said, thus practically multiplying the two natural outlets of the Nile into a network which supplies the whole cultivable area of the Delta.

Cairo Barrage.

The history of the present irrigation scheme in Egypt may be divided roughly into three periods, separated by the main facts of that history, namely, the completion of the Delta Barrage, the original construction of the Assuan Dam, and its final raising to the present height. These periods may be briefly reviewed as follows:

Irrigation History.

1. Up to 1885 (Completion of the Delta Barrage).

The original system of irrigation in Egypt was by "basins," large enclosed areas flooded by the rise of the Nile, which was allowed to lie upon the land for a period varying up to forty days, and was then run back into the Nile as the flood went down. This system gave excellent winter crops, but practically nothing in the summer, except in the most northerly areas, where there is a slight rainfall; and it left the whole of the country dependent on the height to which the Nile rose. A high flood meant plenty; too high meant destruction; too low meant that all except

Basin Irrigation.

those near the river, or who possessed deep wells, lost everything, and probably died of starvation.

But the great schemes of cotton cultivation conceived by Jumel and Mohammed Aly necessitated a new system of irrigation, for basin irrigation meant an insufficient water-supply during the summer, and the complete submersion of the land just as the cotton crop was ripening. The new system, known as "perennial" irrigation, was therefore introduced, and pushed on with the energy characteristic of Mohammed Aly. The meaning of it was that in place of an overwhelming flood once a year, the land should receive by canals a constant but limited supply of water, as required throughout the year, thus enabling the land to be cultivated during the summer as well as the winter. As the extraordinary fertility of the soil of Egypt seems to be quite equal to the task of growing crops all the year round, the result was to increase the yield of the land, and particularly of cotton, in an extraordinary degree.

Perennial System.

But the problem of irrigation lay not merely in the construction of such canals. Every year the flood, bringing down the heavy silt which makes the coveted "red water," left the canals choked with a bed of ooze, and this had to be removed at any cost before the level of the water in the river fell to its lowest point in spring. The greater volume of water and the swifter flow in the river prevented it silting up like the canals, with the result that the canal bed at its intake would be raised above the reduced level of the water in the Nile itself, and no water would pass into the canal at all during the following spring or sum-

Canal Clearance.

mer. Not only so, but a deep canal bed throughout its whole length was the only way to ensure an ample supply of water in the canal in the following flood, especially if the latter should be low.

The result was the development of the *corvée* system of forced labour for the annual canal clearances, which in subsequent years became one of the greatest burdens and abuses of the country. Thousands of the fellaheen* were brought in chains for great distances from their homes, and at the most inconvenient times (when their own land required cultivation), to dig with their fingers, lacking other tools, the wet mud from the canal bottoms. The work had to be done at high pressure, which could only be maintained under the whip; and the descriptions given of the conditions under which it was carried out are simply ghastly, not only in their inhuman cruelty, but in the utter wastefulness of the system from an economic point of view.

Corvée.

It was to reduce the evils of this system that the Delta Barrage was first conceived by the famous French engineer, Bellefonds de Linant, in 1833, begun, on the present site and plans, by Mougel Bey in 1842, and finally repaired and completed by Sir Colin Scott-Moncrieff in 1890. The idea was, by erecting a weir or regulator across the Nile at the bifurcation of the two branches, not only to regulate the flow of the Nile into these two branches, but also to maintain the water at a high level in the river up-stream of the barrage, where the mouths of the great canals take off. This made it possible not

Object of the Barrage.

* Fellah (plural, fellaheen) = peasant, or agricultural labourer

only to do with less depth in the canals at all times, but also to increase the supply entering the canals in spring and summer, and thus to neutralize to a considerable extent the effect of a low summer supply. The advantages to be expected were—(1) to give a much greater supply of water in the canals, and during a longer period of the year; (2) to reduce the labour of the *corvée* by allowing a higher bed-level in the canals; and (3) by raising the surface-levels of the canals to give "free-flow," or flush irrigation, to such lands as lay below the higher level, thus saving the cost of pumping from the canals to the land-level.

Its Failure.

But this great scheme proved at first a heart-breaking failure. Finished in 1861, at a supposed cost of £4,000,000, it gave nothing but trouble from the first. In 1867 the floors of ten of the arches on the Rosetta branch showed such subsidence that the whole scheme was practically abandoned.

At the time of the British Occupation in 1882 the whole question of the Delta irrigation had been under discussion, and, the barrage being regarded as hopeless, an alternative scheme of pumping on a huge scale was under consideration. In 1883, when Sir Colin Scott-Moncrieff was brought from India to take charge of the Egyptian irrigation service, he found the contract for the first instalment of these pumping schemes already signed, while further schemes, to involve a capital outlay of £700,000, and an annual working cost of £248,550, were in contemplation. The story of how he rejected these schemes, and in face of difficulties and discouragements set him-

self to repair and complete the barrage, has been told by one of his assistants,* and need not be repeated here.

Repair and Completion.

It is only necessary to say that from 1884 onwards it more and more completely fulfilled the duties originally intended by its designers, and changed the whole face of the Egyptian Delta.

2. Up to 1902 (Completion of the Assuan Dam).

The success of the barrage was complete. The water-supply of the Delta as a whole, and therefore the area of land under cultivation, increased by leaps and bounds. *Sakiehs*, *shadoofs*, and other pumping appliances lay derelict in many districts, and the *corvée* diminished to vanishing-point. The only difficulty experienced as the result of these improvements was the marked increase of drainage into the lakes to the north, especially Lake Mariut, with the result that its level was materially raised, and occasional flooding in the adjoining Behera province caused damage. To meet this, the government erected pumps at Mex, on the narrow strip of land between Lake Mariut and the sea near Alexandria, by means of which the level of the lake was maintained at about 8 feet below sea-level. The pumps used formed part of the installation provided for the Behera Canal pumping scheme at the barrage.

But the system still failed to meet all requirements in one respect. The increased area of cultivation demanded more and more water, with the result that the total

* Major (now Sir) Hanbury Brown: "History of the Delta Barrage." See also a Report on the work by Sir Colin himself in "Egypt, No. 2 (1890)," p. 150.

supply available in the Nile in a year of low flood was not sufficient, while even in the best years there was a period of great scarcity in early summer before the arrival of the flood. To meet this shortage the idea was mooted of a great storage reservoir at some point up the Nile, which could be filled at the end of the flood, and held ready to supplement the diminishing supply in the Nile in spring and early summer. Such was the scheme of the Assuan Dam, which was completed in 1902; and now the Nile system may be compared to a long lock, open throughout to the sea in flood-time, but closed at the lower end by the Delta Barrage during spring and summer, and kept up to the necessary level by the carefully regulated emission of the water stored up in the great reservoir at the first cataract.

Water Storage.

Assuan Dam.

To complete this system a second barrage was erected at Zifta, on the Damietta branch, and the erection of a third at Atf, on the Rosetta branch, has long been under consideration. So completely is the whole available water-supply of the Nile diverted into the canals for irrigation purposes that the river channels are practically empty below the barrages in early summer, and to prevent the sea flowing back into the deserted channels and spoiling the remaining trickle for drinking purposes, *sudds*, or temporary earthen dams, have to be erected at Rosetta and Damietta, so that now it is literally true that during the summer not a single drop of Nile water reaches the sea by its own channels. Finally, as the water-supply increased, it became possible to extend the system of

Other Barrages.

perennial irrigation to Upper Egypt, and for this purpose barrages were erected at Esna and Assiut, where the main irrigation canals of Upper Egypt branch off from the river. The effect of these improved irrigation facilities on the area under cotton cultivation is very clearly shown in Table I. on p. 294.

Summer Rotations.

The regulation and distribution of the water-supply is embodied in the system known as "rotations," which, however, are of two kinds. Summer rotations mean that during the early summer there is not enough water in the canals for every cultivator to take as much as he likes. All the larger canals are therefore divided by regulators into three sections, which are open or closed to the cultivators of land along the banks in "rotations" of six days open and twelve, fifteen or eighteen days closed. Thus, under easy conditions, each section is open for six days and closed for twelve—*i.e.*, six open out of eighteen.*

Later on, or with less ample supply, a rest-day is inserted between the turns, upon which the whole canal is closed, to allow the water to rise to the necessary level in the next section, thus giving six days open out of twenty-one. If water is very scarce, it may be necessary (as it was in 1912 and 1913) to insert two rest-days, thus giving only six open days out of twenty-four—thus:

A open.						All closed.		B open.						All closed.		C open.						All closed.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

* This is now usually made seven out of twenty-one, so that each section opens in turn on the same day of the week, which is more convenient for administration.

To take water from a section during a closed period *is a criminal offence. The length of the rotations, or* interval between the periods, varies according to the supply available, which again depends upon two main factors—(1) the height and date of the fall of the previous year's flood, because these regulate the date of arrival of the point of low Nile, after which the water stored in Assuan must be drawn on to supplement the falling river; and (2) the probable date of arrival of the coming flood, for obviously the amount of water that can be given depends chiefly (the total stock of water available being practically the same in every year, and limited only by the size of the dam) upon the length of time over which the stock has to be spread. Thus, a low or early falling flood in the previous autumn, followed by a late flood in the following summer, produces the worst conditions of summer supply; while a late or heavy flood in the previous autumn, such as 1908, followed by an early or high Nile, as in 1909, means that the summer rotations are reduced to practically nothing at all, for there is ample water to carry over from the low-water point in, say, March or April, till the arrival of the flood, if it comes early in July.

Variable Supply.

But these summer rotations must be distinguished from the "flood rotations," which serve an entirely different purpose. After the arrival of the flood, the chief object of regulation nowadays is to prevent an oversupply, and this has to be attempted by running the main canals in periods of alternate weeks at high and low level. The idea is that a canal running at high level is bound to cause a

Flood Rotations.

IRRIGATION IN EGYPT.

1. THE CANAL.
2. THE "MISQA" OR IRRIGATION DITCH, AND THE WATER ACTUALLY ON THE LAND.

From photographs kindly lent by N. M. Kerr.

certain amount of infiltration, or seepage of water, into the low land adjoining, especially if the soil is not of an impervious nature; while a canal running empty is really acting for the time as a drain, and drawing back superfluous irrigation water from the land. At the same time this serves a second important purpose. The fellah, whose one aim in life is to get all the water he can, is very slow to believe that under the new conditions of ample summer supply he may damage his crop by over-irrigation after the flood arrives. Where free-flow irrigation is available, he simply turns on the water and leaves it flowing, sometimes not even taking the trouble to come back and close the channel at night. Practically the only way to remedy this tendency to over-irrigation is to withdraw the water-supply altogether at intervals by almost emptying the canal, so that the water falls below the level of his intake, and as the pumps he once employed are probably now dismantled, he is helpless.

A further point in connection with water control must be mentioned. It was found that the areas devoted to rice-growing in the northern parts of the Delta require an amount of water disproportionate to their value, for rice must stand continuously in water, which must be frequently renewed. The area upon which rice cultivation was to be allowed was therefore defined and restricted when necessary, very severely, for example, in 1912 and 1913, while for 1914 rice cultivation was altogether forbidden. The drawback of this is that rice is a reclamation crop, which cleans out salted land, and the restriction of such cleaning crops is to be regretted.

Rice Crops.

3. Since the Completion of the Assuan Dam.

The Assuan Dam completed the system of which the Delta Barrage was the foundation. Since 1902 water scarcity has, relatively speaking, ceased to exist except in an altogether abnormal year, such as 1913. In low years every ounce of water is still required, while the equitable distribution of the available supply requires the constant care of the whole irrigation staff. Daily and hourly they have still to refuse piteous appeals for more water, for the habit of the old days dies hard. In bad years, too, such as 1912 and 1913, there are districts, mostly at the tails of canals, where really serious shortage is still felt; but, on the whole, the system has been a triumphant success.

Improved Conditions.

The improved conditions showed themselves in many ways. Summer rotations were much easier. The supply of water everywhere was increased; new areas were brought under cultivation, which in former years were not worth cultivating, even in a good year, because in a bad year they would not receive water. With water at a high level in the canals, free-flow irrigation became still more common. The increased supply also made it possible to undertake the conversion to perennial irrigation of the last remaining basins in Middle Egypt.

Reclamation.

There still remained, however, pressing need for increased water-supply to carry out a further scheme for improvement which had long been delayed for lack of water. This was the reclamation of great tracts of waste land stretching all along

the northern or coastal portion of the Delta. This land, extending to at least 1,500,000 acres, has been lying waste probably for centuries, owing chiefly to the lack of drainage, or perhaps to a change in levels. Now, at any rate, the land is to a large extent hardly above sea-level at all, and, indeed, in the case of large areas in the western province of Behera, considerably below it. Natural drainage is simply impossible here, because there is no outfall. Large areas of these *berrari* lands, as they are called, are covered by the lakes in flood-time, and in summer are white with salt. To the west, in Behera province, parts of it bordering on the desert are little less sandy than the desert itself, yet the quality and quantity of the crops that are actually being taken from such high-lying patches as have been drained, irrigated, and reclaimed, are surprising. Further east the *boor* land, or dry waste, has the appearance of good black land ruined by want of drainage and water, and only waiting reclamation to become as fertile as any in the country. The whole district carries the most scanty population, and wears an aspect of utter desolation, which is only aggravated by the contrast of occasional patches of cultivation, showing how different the whole appearance of the country might be under other conditions. It is believed that the best cotton might be grown in these northern districts near the sea. The area available is enormous, and the prospect opened up by visions of the whole of this country added to the existing area of Egyptian cotton land are dazzling.

This question, however, had inevitably to stand over for many years, for the methods of reclamation likely

to be adopted depended on the provision, not only of drainage, but also of a liberal water-supply to wash the salt out of the soil, and there had until now been no possibility of meeting such a demand for increased irrigation facilities. Not even the original construction of the Assuan Dam was sufficient for such extensions; the maximum supply which it provided was no more than sufficient to meet the requirements of the area of good land already awaiting irrigation when the dam was completed.

Need of more Water.

The matter might have stood thus for some years had not other circumstances combined to bring up the question of further work on the dam in a form which made immediate action necessary. The dam had hardly been completed when it was found that the action of the tremendous head of water pouring through the sluices was wearing away the solid rock on the down-stream side, and endangering the foundations of the dam; in some cases pot-holes were being formed, which went a considerable distance below the foundations, and the dam was actually digging its own grave beneath its feet. A great apron of masonry had therefore to be constructed, extending over the rock-bed of the river for a considerable distance down-stream, and after some years of observation and experiment an efficient method of doing this was arrived at.

Defects in the Dam.

The next difficulty was the appearance of cracks in the structure, owing to the very great variation of temperature on the outside surfaces of the dam. While the problem of dealing with these defects was under con-

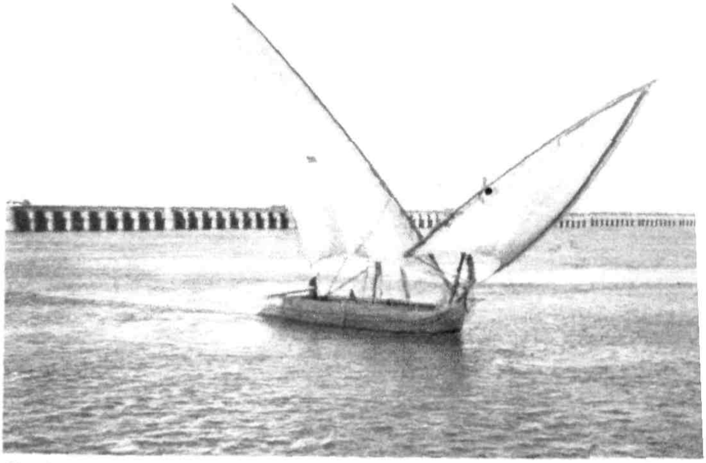


Photo by *Miss M. Tomlinso*

Photo by *A. S. Pearse.*

1. ESNA BARRAGE, AND A NILE BOAT.
2. ON THE NILE ABOVE ASSUAN, SHOWING THE EFFECT OF RAISING THE DAM.

sideration, it was rapidly becoming evident that the total capacity of the dam was insufficient to meet the demands upon it, which had increased even faster than was anticipated. This difficulty was aggravated by a series of low Niles, for the fact that the height of the Nile flood does tend to run in periods which correspond roughly with Joseph's seven lean and seven fat years has been indicated by recent observation. The only way of increasing the supply was to raise the height of the dam, and therefore the amount of water stored in it. The height of the dam as first erected had been considerably reduced from the figures of the original plan, partly in order to meet the outcry against the submersion of the ruins of Philæ; and now, before deciding to raise the dam, a careful examination was again made of every other possible site for an additional dam farther up the river. The result was, however, to show that no other equally suitable site was available. It was therefore decided to proceed with the raising of the dam by another 16 feet, which made it possible to raise the water-level by 22 feet, and so to increase the available storage accommodation by 1,400,000,000 cubic metres, rather more than doubling the original capacity. At the same time, as the increase of height required the strengthening of the original structure to carry the increased weight, the opportunity was taken to thicken the dam at the same time as heightening it. The double operation was commenced in 1907, and the new dam was formally reopened in the autumn of 1912—a year before the contract date for its completion, and a lucky year for Egypt.

Raising and Strengthening.

It was expected that this enormous increase of the storage-supply would fully cover the water requirements of the country for some time to come, and in particular that it would at last render possible the reclamation of the waste lands to the north of the Delta. But the first step towards this reclamation was the provision of a drainage system for these derelict areas; and, in anticipation of the water-supply becoming available, plans for the drainage of this northern zone had long been under consideration.

In the meantime other events had brought the question of drainage sharply to the front. The earliest British irrigation engineers never lost sight of the fact that drainage ought to keep pace with the improved irrigation facilities which it was their first business to provide, and that even in a climate like Egypt, with practically no rainfall, and almost constant sunshine causing heavy surface evaporation, the continued increase of irrigation facilities was absolutely certain to cause damage by overwatering in course of time, unless adequate drainage was provided. They had constantly before them the example of these waste lands in the north, which before Arab times had been fruitful plains, supporting a large population, but which had since become almost uninhabited areas of swampy or salted wastes. The problem was therefore of the twofold nature of prevention and cure—to prevent the lands, which were still so fertile, or would become cultivable with an increased water-supply, from degenerating into a state similar to that of the Berari, and to cure the deterioration of the latter by

Drainage.

Prevention and Cure.

reclamation. But though the necessity of guarding against damage by irrigation was fully realized by Sir Colin Scott-Moncrieff, it was impossible, under the severe financial pressure of these early days, to obtain the funds required for improved drainage. There is on record a statement by him in a report published in the early '90's that a stage had then been reached at which, before any more was spent on irrigation, a sum must be provided for drainage works equal to what had already been spent on irrigation. It is a matter of common knowledge that since then not only have the arrears of expenditure upon drainage never been made up, but millions more have been spent on irrigation, and only thousands on drainage. The truth is that, from the first, improved drainage never kept pace with irrigation; but in later years the enormous development of the latter so completely outstripped the former that the fact that they ought to run together had been almost lost sight of.

A long succession of relatively low Niles up to the year 1907 seems to have directed the attention of the irrigation authorities too much to the difficulties of coping with the needs of an increasing area of cultivation, which in such years strained the capacity of even the Assuan Dam almost beyond its limits. Drainage, in the form of the construction and remodelling of large government main drains, still received large grants; but these seem in later years to have been more and more difficult to provide within the limits of the budget, and any attempt to tackle the whole question of improved drainage throughout the country was forced into the background.

The high flood of 1908, however, followed by the high and early flood of 1909, culminated in a disaster to the cotton crop of the latter year, which changed the whole situation, and brought sharply home to the authorities the fact that, in directing so much effort and expenditure to the problem of maintaining a sufficient supply of water for the worst years, too little attention had been paid to the danger of an over-supply in years of good flood, due to the want of sufficient drainage to carry off the excess. In 1909 all the conditions had conspired to produce a situation which, while abnormal, ought to have been kept in view as a possibility, if not even a probability. The height and late fall of the flood of 1908 meant that an ample supply was carried forward into the spring of 1909, and the Nile did not fall to low-water point until long after the usual date. By that time it was already known, from the gauges which now mark the rise of the river along its whole course, that the coming flood was to be early, and probably high. It was evident that summer rotations would hardly be more than formal, and could be entirely removed at a very early date; as a matter of fact, they were withdrawn about the end of June. The flood arrived fully three weeks before the usual date, and quickly rose to practically the same height as in 1908. The result was that the country, without having had the benefit of its usual period of scarcity, when the blazing sun of early summer scorches up all excess water, was suddenly inundated with a further most liberal supply long before it needed it. It had never occurred to anyone that too much water could do harm. Hitherto all

The 1909 Flood.

records seemed to show that the total amount of the crop was in proportion to the amount of the water-supply, and the idea that too much water was possible would have been laughed to scorn. But now it was obvious; in many districts the fields were absolutely water-logged, the water lying just below, if not actually above, the surface.

Water-Logging.

The effect on the crop was simply disastrous. Up till the middle of October it promised to beat all previous records; then, in one week, it suddenly wilted, and serious boll-shedding set in, with the result that, before the end of the month, the estimates dropped from 7½ millions of kantars to 5½ millions. The boll-shedding happened to coincide with a rather bad attack of boll-worm (to which, in the first place, the whole damage was popularly attributed), with the result that a large part of the expected second picking was lost, and practically the whole of the third, and the actual out-turn of the crop at the end of the season was only 5,000,772 kantars.

The Crop Disaster.

Such a disaster naturally aroused great discussion, but out of the innumerable explanations put forward one gradually assumed prominence, namely, excessive water-supply. Mr. W. Lawrence Balls, then Botanist to the Khedivial Agricultural Society, pointed out that what was happening to the plant was exactly the result which might be expected from the asphyxiation of the root system of the plant by the sudden rise of the "water-table," or level of the subsoil water, at a critical period of the plant's growth; while all available knowledge of the actual water conditions through-

The Cause.

out the Delta went to confirm the theory first put forward by the late Mr. J. R. Gibson, of the State Domains, that the damage was due to too much water.

Controversy.

This startling theory was, of course, at first received with blank incredulity by all except those who knew what had been going on in recent years. For some time before 1909 a good deal of uneasiness had been caused by the fact that, while the acreage under cotton and the total amount of the crop had been increasing materially, closer examination of the statistics showed that the latter was not keeping pace with the former, and that the average yield per feddan (acre) had been, on the whole, going down very materially. Thus, as will be seen from Table I. on p. 294, the average yield per feddan had apparently been as high as 5·80 kantars per feddan in 1897, while the average for the five years from 1904 to 1908 was barely 4·30. In 1908 the Khedivial Agricultural Society had appointed a Commission to inquire into the matter, which, however, reached no definite result. In the first place, it was not certain that the statistics were reliable, and, assuming that the decline was as serious as it appeared, there were many theories to account for it, such as seed deterioration, insect pests, especially the cotton-worm and boll-worm, and over-cropping. The customary rotation of crops had been reduced from three years to two, while the plants were much more closely set than formerly, and artificial manuring was not adopted to a sufficient extent to compensate the strain on the fertility of the soil; for it must be remembered that cotton is only a summer crop, and

Falling Yield.

in Egypt the land is expected to produce two or three other crops during the year. At the same time the Commission called attention in their Report to the insufficient drainage of certain districts, both as regards the construction of new drains and the maintenance or clearing of existing drains.

In 1909 the Government appointed a Commission, who in their Report emphasized the same note of warning with regard to drainage, and gave the first official recognition to the theory which was now rapidly gaining ground, that the reduction of the average yield was, at least, partly due to an excessive water-supply.

Such was the position when, in the summer of 1911, Lord Kitchener was appointed British Agent in Egypt, in succession to the late Sir Eldon Gorst. With characteristic energy he at once took up the question, and had a scheme prepared to deal with the whole situation in the following way: For drainage purposes the Delta may be regarded as divided by imaginary lines running east and west into three ill-defined zones or sections, showing very different conditions as regards drainage:

Lord Kitchener.

1. In the southern or upper zone from Cairo northwards through about one-third of the distance to the sea, the land is considerably above sea-level, and natural drainage by gravitation would be quite easy; but so far such drainage has not been thought necessary, and there are practically no drains in existence. This zone has now an ample water-supply, even under the worst flood conditions, and probably too much in good years, owing to the easy

Existing Conditions.

summer rotations and the tendency of the fellaheen to over-water their lands after the flood arrives.

2. In the middle zone the natural slope available for drainage is less, but no important provision for drainage had in former years been thought necessary. More recently, however, the government had spent large sums on main drains through this zone; but the fellaheen were only beginning to learn the value of these, and to make use of them by draining their fields into them. Great difficulty had also been experienced, owing mainly to lack of funds, in keeping the main drains clear of silt, weeds, etc., while private owners did not seem even to realize the necessity of such clearance. Such drains as did exist in this district had therefore become quite inadequate to meet the enormously increased water-supply, for it was in this zone that the effect of that increase had become most marked. Roughly speaking, the whole district was more or less suffering from an excess of water-supply relative to drainage, with the result that good land had deteriorated in value, and in many cases land which was formerly regarded as the best was now lying derelict—water-logged and salted to such an extent as not to be worth cultivating.

3. In the northern or lower zone, where, as already explained, no natural outfall for drainage existed, there were practically no drains at all, with the exception of the large main drains passing through from the middle zone. This northern zone is almost entirely without irrigation, except from the tail ends of the main canals which supply the upper and middle zones, and which either lose themselves in the marshes to the north or escape into the

lakes or the sea. The raising of the Assuan Dam was expected to provide the increased water-supply required here for the washing out of the land in the process of reclamation and for its subsequent irrigation and cultivation; but the provision of a complete drainage system was the first essential, and this necessarily involved the provision of an artificial outfall by pumping.

The Government Scheme.

The great government drainage scheme, elaborated by Sir Murdoch Macdonald, K.C.M.G., Under-Secretary of the Egyptian Ministry of Public Works, and which is now in process of being carried out, is founded on at least partial acceptance of the theory that excessive water-supply was the chief factor in the damage to the crop. Subsequent discussion has modified first opinions as to the exact way in which the damage is done in particular cases; but the principle is now generally admitted that the level of the subsoil water is an overruling influence in the growth of the cotton crop; that in the middle and lower zones, at least, that level has been materially raised in recent years by the increased irrigation facilities; that the raising has been due to two main causes—(1) infiltration of water into the subsoil from the Nile or from adjacent canals, the water-level in which has been gradually raised to allow of free-flow irrigation; and (2) excessive surface watering by irrigation, especially after the arrival of the flood. The relative intensity of these causes in each case varies not only according to the situation and level of the ground, but also according to its porosity or otherwise, which seems to vary immensely. Underneath the porous surface soil there lie

in almost every case impervious layers of clay, but the depth at which these layers occur may vary greatly, even within the area of a single field. The result may be to produce water-tight "pockets" in the middle of a field, where a moderate water-supply will produce water-logging, while all around it, the surface conditions being apparently the same, no harmful results are produced.

The Subsoil.

The importance of the "water-table," or level of subsoil water, depends on the fact that the cotton plant is extraordinarily deep-rooted. Mr. Lawrence Balls has shown that, under favourable conditions, the root system of the cotton plant will go well over six feet below ground. The actual depth required varies greatly in different districts, according to the climate, for the rate of growth of the root depends almost entirely on soil-temperature, being twice as fast at the most favourable temperature as it is at 10° lower. But the ruling factor in the season's history of the crop is not the maximum depth of clear soil available, but rather the minimum; or, still more important, the period at which the maximum changes to the minimum, owing to the rise of the subsoil water in flood-time. A deep water-table in early summer draws the root down in search of water, and it has been proved that the worst damage is caused by a sudden rise of the water in flood-time, especially if the flood is early, asphyxiating the lower part of the root system, and causing the boll-shedding and cessation of growth of the fruiting branches, which involved so much loss in 1909.

Water-Table.

The truth of this theory is now thoroughly established

by the fact that the failure of the crop in 1909 and its comparative success in subsequent years are in direct correlation with the date and height of the rise of the water-table. It is immaterial whether the increase of the subsoil water is due to infiltration or surface watering; if the joint effect is to raise the water-table till it submerges the root of the plant, mischief will result, in direct proportion to the date and height of that rise. Thus the crop of 7,573,537 kantars in 1910 was mainly due to what are now recognized by a strange revolution of public opinion as more favourable flood conditions.

Crops since 1909.

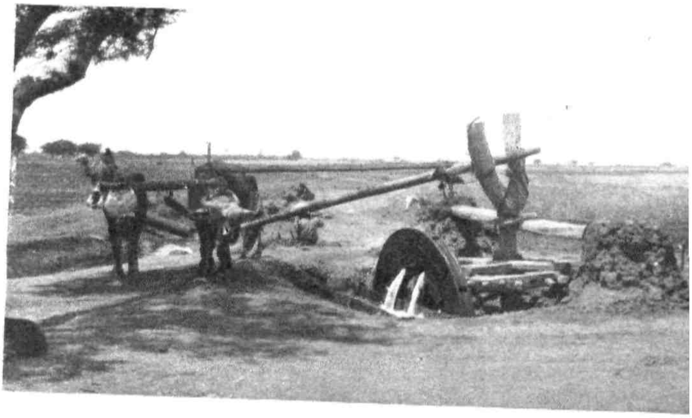
Though of average height, the Nile flood was late, with the result that summer rotations were more strictly enforced, and the period of over-watering greatly delayed. The advantage thus gained was increased by favourable weather conditions during the autumn; an unusual spell of fine warm weather, lasting till late in the year, assisted greatly (by promoting evaporation) in the prevention of excessive water in the soil, with the result that the crop which in October was only estimated at 6½ millions, exceeded that figure by over a million kantars, and established a new record. Analogous conditions in 1911 produced a similar result. In spite of a heavy attack of cotton-worm during the summer, the lateness of the Nile flood, followed by another fine warm autumn, again, much to the surprise of everyone concerned, brought out a crop of almost record dimensions (7,424,208 kantars). In 1912, a comparatively low Nile produced a crop only a little below that of 1910, while the crop of 1913, with the lowest Nile on record, which certainly has not been equalled for

a hundred years, produced a crop of 7,684,172 kantars, and again established a new record.

It was, therefore, no longer questioned that excessive subsoil water was the chief cause of the 1909 disaster; but, unfortunately, the remedies were more obvious than easy. To lower the levels of the canals wherever possible, and to teach the fellah the danger of over-watering, were only the first steps. The entire renovation of the existing drainage system in the middle zone was also clearly indicated, as well as its extension to large undrained areas in that zone, and to the whole of the northern zone. This, it was soon evident, was not only necessary to prevent the conditions of 1909 being repeated, but would be the essential preliminary to any attempt to cure the damage done by the flood of 1909, for that damage was partly cumulative. The rise of the water-table from the salted subsoil to the surface, or near it, left the ground in a soured and salted condition, which did not entirely or immediately disappear with the subsequent fall of the subsoil water to its old level. It therefore became apparent that a great deal of what practically amounted to reclamation would be required, even in the middle zone, to restore what had formerly been good land to its original condition, and the first step to this reclamation was the provision of adequate drainage.

Remedies.

The probable cost of such an undertaking, even if restricted to the middle zone, would be enormous; but the danger of repetition of the conditions of 1909 rendered it absolutely imperative. The loss of one-third of the crop in that year cost Egypt at least £10,000,000 sterling.



1. A FORM OF THE "SÁKIA" OR WATER-WHEEL.

2. THE ARCHIMEDEAN SCREW USED FOR WATER LIFTING.

From photographs kindly lent by N. M. Kerr.

But an ingenious way out of the difficulty was found by extending the scheme to include the northern zone.

The Cost.

Although this meant increasing the cost of the scheme to at least £10,000,000, it is likely to prove true economy in the long-run, for the reclamation of 1,000,000 acres or more of waste land in the northern zone, worth, on a moderate estimate, at least £50,000,000, would not only cover the whole cost of the drainage scheme for both zones, but would also be the most certain way to derive the full benefit from the expenditure on the raising of the Assuan Dam.

The government scheme is therefore to provide drainage in the meantime for both the middle and lower zones, but not for the upper. This decision rests on the belief that the latter does not in the meantime require

Upper Zone.

drainage, or, at least, that it can wait. It is not thought that much damage has been done by water in these high-lying lands, which are sufficiently above sea-level to possess natural drainage. It is hoped that it will be sufficient in their case to introduce a more careful system of regulation of the water-supply, so as to minimize infiltration of water into the subsoil, and to check, as far as possible, the tendency of the fellaheen to over-irrigate. These ends may be secured by the following means: (1) By keeping the canals permanently at a lower level, so as to reduce, if not practically to abolish, free-flow irrigation, which is already relatively uncommon in this zone during the summer. As long as the fellah gets water for nothing, he will not exercise discretion in the amount taken. Nothing but the absolute impossibility of getting it, or

the labour of lifting it, will effectually check the tendency to excess. In spite of the fact that the abolition of free-flow irrigation will mean an outlay which is relatively serious to the small proprietor, it is strongly held by many of the best authorities that it would be worth it. To make him lift the water, though it were only a couple of feet, would cost little, and would repay him in the long-run by an increased crop. (2) By running the canals full and empty in alternate periods; the usual period for these flood rotations is seven days full and seven days empty. At the same time this system of flood rotations should be extended over the whole country, and continued throughout the winter, from the arrival of the flood till the commencement of summer rotations in the following summer. Until recently the canals ran full all winter, except for the period of about forty days, when they were entirely closed for winter clearance. (3) A great deal could be done in the direction of keeping back the high levels in the canals at the beginning of an early flood, which would otherwise fill the canals too soon. At present the Delta Barrage is closed down from about April to August, and the very first rise in the river is utilized to raise the level in the canals, long before the date at which in the old days the arrival of the full flood brought high levels to the canals. The result is the anticipation of flood-levels in the canals, which in years of early flood, such as 1909, is of very doubtful advantage.

Such regulation, of course, can only affect those districts irrigated entirely by canals; nothing can be done with the Nile or the lands directly watered from it. But

even an experimental regulation of the level in the canals during a year of early flood would offer a most useful comparison between the effect on the lands adjacent to the Nile and those served by the canals. Infiltration of the subsoil water from the Nile and the high-level canals has certainly had a considerable share in the damage in past years. The effect of the Nile level on the subsoil, even at very considerable distances, has now been proved. To control the canal levels while the Nile level is beyond control would provide a very useful object-lesson in the causes of water-logging.

But while it is not proposed in the meantime to tackle the drainage of the upper zone, the possibility of such an extension has been carefully kept in view, and nothing is being done under the present scheme which will not fit in with such a development, if thought desirable later on. At present public opinion, of a much higher grade than that of the fellaheen, is certainly not converted to the necessity for it.

With regard to the lower and middle zones, the broad outlines of the government scheme are as follows: It is proposed to deal with the whole country by sections, taking two sections at a time. A commencement was made in 1911 with two sections, known as the Western Behera, or Mariut scheme, and the Central Gharbieh, or Borollos scheme. and it is hoped to have these finished in from three to four years from that date. The remainder of the northern area will probably fall into about six more sections, and the whole work is estimated to occupy about sixteen years, and to cost at least £10,000,000, without

Present Plans.

counting the subsequent cost of irrigation and reclamation.

The following general principles have been laid down for the two sections of the drainage scheme now in hand: (1) The whole country is to be covered with a network of government drains, with secondary and tertiary channels leading into them, and so close together that no part of the district will be more than about one and a half miles from a government drain. As part of the land to be drained is at or under sea-level, an artificial outfall must be provided, and this will be done by great pumping-stations, erected and maintained by the government at the tails of the main drains. The level of the drains will be such as to give a minimum of 5 feet between the surface of the water in the drains and the surrounding soil-level. This will hold good for all the government main drains, as well as the secondary and tertiary; and it means that, even making the fullest allowance for greater slope in private channels, no field in the whole area need have less than a clear 3 feet of effective depth of drainage in the drain along its borders. (2) The slope of the main drains is to be not less than 1 in 20,000. This is a very ample slope for drains of the dimensions intended, and should greatly assist in the work of keeping the drains clear of silt and weed. Special arrangements will, however, be made, in view of the necessity of clearance, and, whenever possible, the drains will be kept clear of all permanent obstructions under water or overhead, so that dredgers may pass up for clearing purposes.

General Principles.

So large and important a scheme, involving a revolution

Photos by *A. S. Pearse.*

1. IN AN EGYPTIAN COTTON FIELD.
2. LEVELLING LAND IN EGYPT.

in the agricultural drainage of the country, has naturally aroused controversy on many points, into which we cannot enter here. The point most disputed is the proposal to deal with the drainage of each section of the country by one enormous pumping installation at the tail of its great main drain, instead of dividing it into much smaller areas, each pumping direct into a high-level canal, flowing by gravitation to the sea. The government proposal has been very bitterly criticized, but it seems to the writer that the question is one which only experience will decide. If these critics prove to be correct, the failure of the government scheme will certainly involve enormous loss; but those who are in charge of the scheme are fully alive to this risk, which they are probably in a better position than anyone else to value, as against the admitted advantages of the government scheme, in simplicity and economy both of construction and maintenance.

Controversy.

Already, however, the calculations upon which this great reclamation scheme is based have been rather seriously disturbed in another way by an extraordinary combination of circumstances. As we have explained, the essence of the scheme was that the raising of Assuan Dam would provide an ample margin of water-supply; but the very first year after its completion has raised doubts on this point. In 1912 the Nile flood was distinctly low, but the dam, which, fortunately, was ready a year in advance of the stipulated time, saved the situation completely. In 1913, however, the flood conditions fell below all records: it came later, and touched a lower level than has

The 1913 Flood.

been known for at least a century. Had it happened thirty years ago, such a flood would have meant starvation to perhaps half the country. Even two years ago it would have meant serious shortage. As things are, it strained the capacity of the newly raised dam to its utmost limit.

The situation thus created is rather disconcerting. It is history repeating itself: no sooner has the water-supply been increased, than the demands upon it have again outstripped the new supply, and once more we are faced with the fact that, while there is abundant water in ordinary years for all the existing cultivated area, and even some to spare for the extension of that area, such extension is barred by the fact that in bad years the maximum supply would be insufficient. As the strength of a chain is the strength of its weakest link, so the limits of the extension of cultivation in Egypt are set by the amount of water available in the worst years. It is now rather doubtful whether the reclamation of the whole of the northern zone can be brought within these limits. It would be folly to spend millions on the drainage and reclamation of these lands if every now and then they are to be left waterless, and therefore cropless, for a year, owing to the failure of the flood. Once more, therefore, the Egyptian irrigation officials are faced with the task of finding a new way of increasing the supply.

More Storage.

Fortunately, there will be no difficulty, other than financial, in doing so, and already two new schemes are on foot for the purpose, namely, a new dam on the Blue Nile at Sennar, and another on the White Nile about forty miles south of Khartoum. The former will be more

fully dealt with in the following chapter dealing with the Sudan, to which alone it belongs; but the relation of the latter to the Egyptian irrigation system must be explained here. The Blue Nile Dam is to be merely a regulator for the irrigation of the Sudan itself, but the White Nile Dam is to be an integral part of the whole irrigation system of Egypt and the Sudan. The problem in Egypt now is to increase the supply of water coming into Egypt by the Nile at Wady Halfa, and there is one way in which this can be done. The Nile supply comes from two entirely different regions, lying very far apart. The first is in the mountains of Abyssinia, the winter rains from which come down the Blue Nile in a raging torrent charged with the precious silt of which Egypt is largely composed. At Khartoum the Blue Nile meets the White Nile, which, in a less violent way, has travelled nearly 2,000 miles from its source in the Victoria, Albert Edward, and Albert Nyanzas, in the centre of Africa. So great is the rush of the Blue Nile in high flood that it actually blocks the mouth of the White Nile at Khartoum, and dams its waters back for many miles to the south. Then, as the Blue Nile goes down, the penned-up waters of the White Nile begin to flow freely northwards, and form the tail end of the flood in Egypt. It is this temporary closing of the outlet of the White Nile which has led to the formation of the great sudd-regions along its course through the Southern Sudan. There the river extends for miles in width, with hardly any recognizable channels, and forms great marshes choked

Sudan Schemes.

Blue and White Niles.

The Sudd.

with papyrus and other vegetation. These marshes are responsible for the loss of a tremendous amount of water from the White Nile by evaporation, and various schemes have been devised to provide a reservoir on the White Nile in which this surplus water could be stored until the channel north of Khartoum is able to carry it.

White Nile Reservoir.

The scheme now under consideration is to erect a great dam, which will convert the White Nile itself into such a reservoir, thus making it possible to hold back the waters of the White Nile while the Blue Nile is in high flood, and discharge them later on. This would not only have the advantage of prolonging the period of the flood in Egypt, but would also make it possible, if the flood-level in Egypt were rising to a dangerous height, to keep the rise within safe limits by holding back the weight of the White Nile. It must be remembered that it requires constant care in years of high flood to prevent the bursting of the Nile banks in Egypt, and Sir William Willcocks has repeatedly sounded the alarm as to the damage which a really high flood might still do in Egypt. It cannot be questioned that if a flood were to come, as high as that of 1913 was low, it would strain the powers of the Nile bank guarding system to breaking-point to prevent a disaster in Egypt, which, under the conditions now prevailing, would mean a loss of life and property unparalleled in the history of the country.

Flood Control.

So much, then, for the water-supply, which is the basis of all cultivation in Egypt. It remains now to consider

the conditions under which the supply is utilized and the methods of cotton growing. Reference has already been made to the marvellous fertility of the soil, which enables it to be cropped almost continuously, winter and summer. Cotton, therefore, usually follows hard upon a previous winter crop, frequently *berseem*—a gigantic clover, which is practically the only forage crop grown in Egypt. Three to five cuttings are taken during the winter off this crop, which is then ploughed under about the month of March, to make room, and incidentally to provide nitrogen, for the cotton crop.

Crop Rotations.

The general methods of cotton cultivation in Egypt, though apparently primitive and antiquated to the last degree, are, on the whole, very suitable, and have in many cases, as the result of modern scientific research, been proved to be absolutely right, from the point of view of the fellah's immediate profit. Cultivation is highly intensive, and small holdings are the rule. One to two acres will keep a man and his family in comfort. Many of the fellaheen own their own little plot, and if it is too small to provide a living, they will eke it out by day-wages earned on the land of their wealthier neighbours. In 1913 there were no less than 1,411,158 persons, equal to nearly one-half of the adult male population, who were proprietors of less than five feddans, and the average of their holdings was just over one feddan. The fellaheen are models of patient, willing, and apparently unending industry, and are in reality probably no more conservative in the bad

Primitive Methods.

Small Holdings.

sense of the word than the peasant proprietors of a similar social class in any other country. Ninety per cent. of them are absolutely illiterate; but, though slow to adopt innovations, they are quick to see their own interests, and, on the whole, are probably as fine a class of agricultural labourers as the world can show. It is, indeed, no exaggeration to say that, as the result of our survey of the conditions under which cotton is produced all over the world, Egypt stands out above all the others as the one country in which conditions, methods, and results are, on the whole, the best and most creditable. No country in the world can equal the average yield of over 450 pounds of lint-cotton per acre, which, as already pointed out, is a marked falling off from the figures of ten years ago in Egypt. The quality of the cotton grown is inferior to none except Sea Island, and, in spite of difficulties which have resulted in deterioration of a large part of the crop during the same period, it is quite certain that Egypt has not reached the limit of her powers in regard to quality. There is good reason to believe that in the newly reclaimed districts to the north new types of cotton can be produced, which will run all but the best "Islands" very close indeed.

Labour-Supply.

High Yield and Quality.

Following the same lines as in preceding chapters, the chief varieties of cotton grown in Egypt may be briefly described here, as follows:

Varieties.

1. Ashmuni is probably the original Brown Egyptian cotton. In length of staple it is the lowest grade of Egyptian, being as a rule about $1\frac{1}{4}$ inches or less. It

is now grown almost entirely in Upper Egypt, where no other variety has yet proved successful. Like almost all Egyptian cottons, it is brown in colour, and very strong. The ginning out-turn is about 100, meaning that 100 rotls (pounds) of lint can be taken from the "big kantar" of 315 rotls of seed cotton.*

2. Afifi (or Mitafifi) still forms the bulk of the Egyptian crop, and under the name of Brown Egyptian, the price of fully good fair cotton of this variety is the basis price of the Egyptian market in Liverpool, corresponding to middling American. Indeed, to a Lancashire spinner "Egyptian" cotton means Afifi, and nothing else; all the other types of Egyptian cotton are spoken of by their distinctive names, such as Uppers, Abbassi, etc. Afifi was selected accidentally from Ashmuni about 1882, and introduced commercially about 1887; it has therefore enjoyed quite a long life for any commercial variety under present conditions. In staple it is longer than Ashmuni, say up to 1½ inches, and it has also a higher ginning out-turn, about 103 to 105.

3. Assili (or Assil-Afifi), introduced about 1910, was at first thought to be a reversion to the original pure strain of Afifi, hence the name, which means "thoroughbred"; but it has now proved to be no more pure than other commercial varieties—in other words, not pure at all. It was at first very remarkable for its high ginning out-turn, averaging 106 or 107, and figures up to 112, or over 35 per cent., have been obtained.

4. Nubari is similar in character to Afifi, from which it

* Hence the "small kantar" of 100 rotls (equals exactly 99·05 pounds), invariably used for lint weight in Egypt.

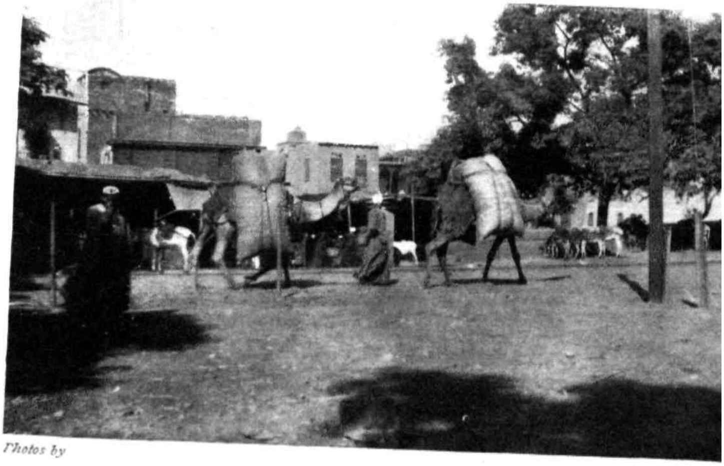
was selected about 1905, but is superior both in length and strength of staple to the general run of Afifi as it now is, while its ginning out-turn is at least as good.

5. Abbassi is the whitest of all Egyptian cottons, and is very fine, and of good length and staple. It was introduced about 1893, being a selection at second hand from Afifi. Its ginning out-turn is a little less than that of Afifi, but distinctly above Ashmuni.

6. Jannovitch dates back to 1899, and was originally a chance selection from Afifi. It has a very fine, long and strong lint, fully $1\frac{1}{2}$ inches in length, and is not quite as brown in colour as Afifi. It has proved an exceedingly useful cotton in Lancashire, especially for the production of fine twist yarns where strength is essential, as in sewing-cottons, for example. It is said to yield about 10 per cent. less than Afifi or Abbassi, and its ginning out-turn is about the same as Ashmuni.

7. Sakellarides, or Sakel, as it is commonly called, is a comparatively new variety, dating from about 1907. It is similar to Jannovitch, but superior in some respects, and lighter brown in colour. It has proved a serious competitor to Georgia and Florida cotton. Its cultivation has increased very rapidly since its introduction, owing apparently to the fact that it grows well almost anywhere in Egypt, whereas most of the other finer varieties are only found at their best in particular districts. It is also a heavy yielder, being markedly unlike the other finer grades in this respect. Its ginning out-turn is also slightly higher than Jannovitch.

Statistics as to the relative area under each of these



Photos by *A. S. Pearse.*

1. HAND-SPINNING IN EGYPT.
2. CARRYING COTTON TO THE GINNERY.

varieties are very unreliable,* and differ greatly from different sources, but the best information available on the subject will be found in the table on p. 295. The general tendency, as will be seen, is towards the increase of Jannovitch, and latterly of Sakel, at the expense of Afifi. This tendency points to another feature of the recent history of the Egyptian crop, which is in unpleasant contrast to the high terms of praise in which we have so far spoken of it, namely, the marked deterioration in quality, and especially in strength, of Afifi cotton, and to a smaller extent of all the other varieties. This tendency to deterioration of particular varieties is no new thing in the history of Egyptian cotton. Many of the varieties which are still remembered by spinners of the older generation are now entirely extinct, such as Gallini, Bamia, Hamouli, and Abyad, and this has given rise to the belief that such deterioration is inevitable, that every new variety has its day, but that none can retain its position permanently.

Variety Statistics.

On this point, again, we are indebted to Mr. Lawrence Balls for the explanation of the scientific truth which lies behind a popular theory. The gradual and apparently inevitable deterioration is due, not to anything inherent in the plants themselves, but to the conditions under which they are grown, and the method, or lack of method, of selecting seed. Under ordinary field conditions even an absolutely pure strain of cotton, if such were in existence, would rapidly become mixed by natural hybridization, or crossing from

Deterioration of Afifi.

* See p. 289.

plants of other varieties growing near by, and as these other varieties are in many cases inferior, the result is deterioration. There is, for example, in Egypt a weed-cotton, known as Hindi (meaning Indian, though there is little evidence to justify such an inference as to its origin), which has had a great deal to do with the deterioration of Afifi. The fact of that deterioration is now not disputed, nor that the chief cause was defective seed-supply. It is probable, however, that there were other contributory causes, such as over-cropping, and perhaps even over-watering, though the exact connection between the effects of the water-table on the root system of the plant and the subsequent development of the lint is only now being fully worked out by Mr. Balls. Of more immediate importance is the question of how this deterioration is to be prevented in the future, or cured. On this point Mr. Balls' work, first for six years under the Khedivial Agricultural Society, and later for three years as Government Botanist in the Department of Agriculture, has thrown a great deal of light. He has proved that it is possible, by breeding in accordance with Mendel's law of heredity, to obtain new varieties or pure strains of cotton, possessing all the desirable qualities of the best of the former types. These new varieties can be kept reasonably pure if sufficient trouble is taken to establish a system of seed distribution under proper precautions as to seed selection in the ginneries, etc., the whole system being based upon the constant renewal of the supply from the original source of seed grown under conditions which make absolute purity not merely

Breeding of New Varieties.

possible, but almost certain. Having succeeded in selecting a number of different varieties which gave promise of proving suitable for different sections of the trade, including an excellent "bread-and-cheese" cotton and a remarkable Super-Sakel, Mr. Balls then proceeded to inaugurate a system of seed distribution on a commercial scale through the State Domains, which in the course of five years would have provided Egypt with a seed-supply better than anything she has ever had. For reasons best known to themselves, however, the Egyptian Government thought fit to abandon this work, and Mr. Balls was allowed to leave Egypt on the expiry of his contract at the end of 1913.

Seed Distribution.

The methods of cotton growing under irrigation in Egypt may now be briefly described. It is almost entirely done by hand-labour, the chief implements being a very primitive plough and the ever-useful *fass*, or hoe, which in the hands of the fellah can be made to serve an inconceivable variety of purposes. The ground is ploughed three or four times, each ploughing being at right angles to the previous one. The ridges are first made roughly with the plough, and are then properly shaped, and the clods broken up with the fass. It is generally considered advisable to allow an interval of a month between ploughing and sowing. The ridges are only from 24 to 32 inches apart, and the plants seldom wider than 12 to 18 inches. The seed is sown in the ground when dry, but a watering is given immediately afterwards. Ten to twenty seeds are

Methods of Cultivation.

put in each hole and sometimes a bean to help the young seedlings to force their way through the heavy soil. The seed-holes are made, not in the top of the ridge, but about 3 inches down on the south side, so as to protect the seedlings from damage by the strong north winds, which are so prevalent in Egypt as to form an important economic factor in the wealth of the country. It is this constant north wind which enables traffic to be carried up the Nile against the stream, even in flood, more easily than it comes down-stream.

In thinning out after the seed has germinated, two plants are left in each hole, as against only one in India and America. Planting generally begins in March or April in the north. A killing frost is, of course, unknown in Egypt, where, indeed, weather hazards are reduced to a minimum. Early planting, within certain limits, is an advantage later on, as the earlier maturing cotton has a better chance of escaping damage by boll-worm (which must not be confused with the American boll-weevil) in autumn; but in each district there is a customary date for sowing, and planting before that is no gain.

Sowing and Watering.

About three weeks after sowing and the first watering, the fields are hoed with the fass to keep down weeds and break up the soil; this may be repeated about a fortnight later, and the rows are then thinned out and the second watering given. The third is about the end of May, followed by another hoeing, and from then onwards the frequency of the waterings is regulated mainly by the supply available under the rotation system already described.

Natural manure is scarce, and the use of artificial

fertilizers is not general. The berseem which precedes the cotton is rich in nitrogen, and is helpful to the cotton crop. This has probably had a great deal to do with the maintenance of the fertility of the soil in Egypt.

Fertilizers.

Cotton picking begins about the end of August in Upper Egypt, and early in September in the Delta. It is largely done by boys and girls and old people, and their method of carrying the cotton when picked is interesting. Their whole clothing consists of little more than a long blue *galabieh;* by tying a string round their bodies they convert this into a sack. When it is full, back and front, they walk to the side of the field, stand in the middle of a white sheet stretched out on the ground, and untie themselves.

Picking.

The wages for picking, as for all other forms of labour in Egypt, are very low, say from 5d. a day up to 1s., or a little over. The cotton is as a rule picked very clean, and although, as already explained, Egyptian cotton requires much more care than Upland, even a child can pick 30 to 50 pounds of seed cotton per day. The cotton is collected into long bags holding about 400 pounds, two of which form a convenient load for a camel.

Wages.

There are generally three pickings, but on more than one occasion the first picking has been the bulk of the crop. As a rule it is of much better quality than the others, and seed for sowing purposes is always taken from it. The last picking may be as late as December, but the cotton stalks must be pulled up not later than December 31, because they provide winter quarters for the

boll-worm. It is as a rule immediately followed by another crop of berseem.

The ginning and baling system in Egypt is at first sight primitive and out of date, but the result produced is very satisfactory. The contrast in almost every respect with the American conditions is most instructive. Little attention is paid to labour-saving appliances, such as pneumatic suction-plant for feeding cotton to the gins, and carrying it to the press, because labour is cheap and fairly efficient. On the other hand, the whole system of handling the crop from the field to the ship has been built up as if all parties concerned had only one interest in view, namely, the production of a satisfactory bale. The system may be briefly described as follows:*

Ginning.

Cheap Labour.

The cotton is taken to the ginneries on camel-back, as already referred to, by train, by river, or by canal, in long bags containing about 400 pounds of seed cotton. As an evidence of the physical strength of the Egyptian native, it may be mentioned that one man will carry one of these 400-pound bags on his back up an incline into the gin-room, for which feat of strength he receives 2½d. The gins employed are all roller-gins, and are fed almost entirely by hand. Egyptian cotton seed is a clean or black seed, and the whole of the lint comes off in the gin except for small tufts on the ends of the seed. The cotton is baled at the ginnery by hydraulic pressure after the following very rudimentary cleaning process: The floor of the press-room is constructed like a sieve; the cotton is scattered over the floor, and is then

Roller-Gins.

* For detailed account see A. S. Pearse's "Cotton Growing in

thrown up into the air, thus shaking a certain amount of dust out of the cotton, and allowing it to fall through the floor. It is then more or less watered with syringes, and again shaken and watered. This watering process is believed to be very common, except in the ginneries belonging to the State Domains, and during the last few years there has been a good deal of controversy on the subject. A similar custom is observed in certain parts of India, where a hose is turned on the bags of cotton in the yards, but there is no evidence of any similar practice in the United States.

Damping.

The hydraulic bale usually contains about 700 or 800 pounds of cotton, and in place of the mechanical tramper or packer used in the American ginneries, the cotton is literally tramped down in the press-box by half a dozen natives. The hydraulic bale is forwarded to Alexandria, where it goes to the market at Miniet-el-Bassel, belonging to the Alexandria General Produce Association. There it is sampled and sold for export. It is then taken to the steam-press, where it is entirely opened up, examined, watered again, and re-pressed to a density of about 35 pounds with new canvas and hoops weighing little over 20 pounds, the canvas being carefully stitched up like a bale of Manchester dry goods, so that the contents are completely covered. The result is to make the Egyptian bale a model to all the world, and a very striking contrast to the American.

Baling and Compressing.

The most important cotton pests in Egypt are the cotton-worm, the boll-worm, and, since 1912, the pink boll-worm, or seed-worm. The cotton-worm is not reported as having done serious damage before 1877, but no serious attempt

was made to deal with it until 1883, when a Government Commission was appointed, with very little result. In the following year another Commission was appointed, the object of which was to spread information amongst the growers regarding the cotton-worm, and to prove to them that its ravages could be controlled if they would bestir themselves. These efforts, however, had little effect except among the larger landowners. From this time onwards certain years stand out prominently as bad cotton-worm years, especially 1886, 1891, 1895, and 1904. In some of these years the damage to the crop has been assessed at millions of pounds. In 1904 it was estimated that half the crop in the Behera province was lost owing to the ravages of the worm, and the total loss throughout the country was estimated at over £2,000,000 sterling.

Insect Pests.

The adult of the cotton worm is a moth known to scientists as *Prodenia litura* Fabr. It lays its eggs in masses on the leaf, containing anything from 100 to over 1,000 eggs. The incubation period lasts from three to five days, and the larvæ, or young caterpillars, attack the lower side of the leaf, which dries up and turns brown. At a later stage they will sometimes attack the flower-buds and young bolls. The life of the larva averages about a fortnight to three weeks in summer. When mature it burrows into the ground, and after about two days the pupa appears, followed about seven to fourteen days later by the adult moth. The breeding period of each generation is therefore about four or five weeks, so that there may be as many as seven distinct broods during the season. The earliest appear in the spring on the berseem

Cotton-Worm.

crop, and when that is finished about the end of May the moths fly to the cotton, which forms their principal food during the summer. From June to August at least three generations of larvæ are hatched on the cotton.

Remedies.

The chief remedy is hand-picking of the leaves on which the egg masses have been deposited, though many other methods, such as spraying the plants and the ground, or trapping the moths, have been tried. As the pest undoubtedly passes from the young berseem to the cotton, it has been thought advisable to compel the fellaheen to finish off their berseem crops earlier in the season than they would otherwise do.

Government System.

Since 1905 the government have from time to time inaugurated a regular campaign for the destruction of the cotton-worm by a system which practically amounts to universal forced labour in the districts affected. This seems to be justified by the results, for in those years when the system was enforced thoroughly, and especially early, the damage to the crop has been relatively slight, whereas in other years when the English inspectors were withdrawn the pests have simply ravaged the whole country. Since Lord Kitchener's appointment the former has become the invariable rule, and the cotton-worm has been kept entirely under control.

Boll-Worm.

Unfortunately, it has not been found possible to deal so effectively with the boll-worm, which is for that reason a more serious enemy to the cotton crop than the cotton-worm. As in the case of the latter, the damage done by the boll-worm varies greatly from year to year. It appears to have first

attracted attention in 1865, when it was described by Jannovitch Bey, the discoverer of the cotton of that name. Probably, like the cotton-worm, it had been in existence in the country long before that, but the large areas of land which were brought under cotton cultivation in Egypt about that time, on account of the American shortage, would tend to its multiplication. The difficulty of dealing with it was increased by the fact that for a long time its very existence was not recognized by the fellaheen, and the damage done by it was attributed to other supposed causes, especially fog. It is not until the cotton is ready to be picked that the damaged bolls are seen, and as morning fogs are frequent at that period of the year the damage was attributed to these or other unfavourable climatic conditions.

The adult boll-worm, like the cotton-worm, is a moth, its scientific name being *Earias insulana.* It is impossible to give any estimate of the financial loss resulting from its attacks, though it must be enormous. The very low average yield in 1905, for example (3·80 kantars per feddan), was almost certainly attributable to boll-worm, the total damage in that year being estimated at £1,400,000. It seems to confine itself entirely to plants belonging to the same botanical order as cotton, which in Egypt is represented by cotton, bamia, tehl, and the garden hibiscus. The eggs are laid mostly on the bolls, generally singly or in pairs, and during the night; and the moths are never seen flying about during the daytime. During the summer months the egg stage lasts from three to four days, and when hatched the young boll-worm proceeds to bore a hole into the boll. It attacks the soft

juicy seeds, and incidentally damages much of the fibre in eating its way through it. The young bolls thus attacked dry up without opening, and may fall to the ground. If the boll is more matured it splits prematurely, and much of this so-called dead cotton is picked and thrown in along with the good cotton to add weight. Even the cotton in those locks of the boll which have not been attacked by the worm may be affected in quality. On reaching full growth, which takes about a fortnight in summer, the boll-worm emerges from the boll on which it has been feeding, and spins a cocoon in which it passes the pupal stage, which lasts from ten days to a fortnight. There are at least five generations during the season, from May to November, the last three doing the greatest amount of damage. As already referred to, they seem to live through the winter, finding food in the stalks of the cotton and other plants of the same genus, hence the law compelling the cotton stalks to be pulled up not later than December 31.

Remedies.

The boll-worm's habit of feeding inside the boll makes it very difficult to get at, so that no successful remedy has yet been discovered. The only effective remedy would be to pick the whole of the bolls attacked by the first batch of the pest in early summer, but this is not practicable, owing not merely to the labour involved—" a stitch in time saves nine " is a proverb which makes no appeal to the Oriental—but also to the difficulty of distinguishing the infested bolls with any certainty.

The pink boll-worm (*Gelechia Gossypiella* Saunders) was first reported and described in Egypt in 1910, but since

1912 it has increased with appalling rapidity. The larva seems to enter the boll and attack the seed, eating out the whole contents of the seed from the shell. Perhaps the worst feature of this pest is that it remains in the seed after the cotton is picked, and may even pass unharmed through the ginning process, so that it is carried over in the seed reserved for next year's sowings, and may in that way cause increasing damage in successive crops. So far, however, very little is known of its exact methods, or what remedies can be adopted. Like the boll-worm, however, it promises to be very difficult to handle. Apparently it has caused very serious damage to the crop of 1914, as was indeed prophesied when effective measures were not taken in the autumn of 1913.

Pink Boll-Worm.

The statistical system of Egypt, so far as cotton is concerned, is on the whole very satisfactory. The statistics of area are based on information supplied by the sarrafs, or native tax-gatherers, employed by the Ministry of Finance in connection with the assessment of the land-tax. In 1908, when the Khedivial Agricultural Society's Commission was inquiring into the apparent reduction of the average yield per feddan, many responsible people questioned the accuracy of the sarrafs' returns of acreage under cotton, and alleged that the apparent reduction of average yield was largely due to a more complete recording of the acreage than had been possible, or at least customary, in previous years, or to excessive estimates of the acreage in later years. To

Statistics.

Sarrafs' Returns.

settle this question the government instructed the Survey Department to make, in 1909 and 1910, an independent survey of the whole country, with a view to providing an entirely new computation of the cotton areas, as a check on the accuracy of the sarrafs' figures. This was duly carried out, and very full reports were issued, not only giving and discussing the results, but also describing in detail how the survey had been carried out. Further, in a very careful analysis, Mr. J. I. Craig, of the Computation Department of the Survey (now Director of the Statistical Department), gave very complete evidence to show the general accuracy of the survey. It is based upon a complete system of large scale maps of the whole country, on which every individual holding in the whole cultivated area of Egypt is separately shown with its area, all this information being based upon actual measurement. To arrive at the area under cotton every one of these individual holdings likely to contain cotton was personally visited by the survey officials and its actual contents noted.

The result was to vindicate completely the general accuracy of the sarrafs' returns, and after continuing the special check by the Survey Department to a modified extent till 1911, the work has since been left entirely to the Direct Taxes Department as formerly. It is therefore probable that the area figures in Egypt are at least as reliable as in any other cotton-growing country in the world.

It is unfortunate that the same confidence cannot be placed in the figures given as to the areas under different varieties, but the reason for this is obvious. Varieties of cotton which may differ as widely as possible in the lint are so alike in the early stages of growth that in many cases

an expert could hardly tell the difference in spring, when the sarrafs' survey is made. They have therefore only the word of the grower to go by, and that is far from reliable, for, quite apart from the inherent difficulty of getting a native to give a straight answer to a simple question, instead of giving the answer which he thinks is likely to please the questioner, the fellaheen are in many cases very ill-informed as to what kind of seed they have planted, even assuming that the merchant has supplied what they ordered. In 1909 and 1910, therefore, the Survey Department figures as to the areas under different varieties were markedly different from those of the sarrafs, though following similar lines, so that nothing more than general tendencies can safely be inferred from the latter in comparisons of different years. Since then attempts have been made to check these statistics by estimates from other sources, *e.g.*, the amount of different kinds of seed sold for sowing purposes, and the amount of the different varieties of cotton actually handled at the ginneries. None of these statistics agree in detail with those of the sarrafs nor with each other, but they all show similar general tendencies.

Variety Statistics.

In 1912 the Department of Agriculture began publishing monthly reports on the condition of the various crops, including cotton, throughout the season, based on the model of the American condition reports. The value of these reports, however, is simply comparative. They do not contain materials upon which to found an actual estimate of the crop, as, although they are expressed in percentages, there is no means of telling what yield of a crop is repre-

Government Reports.

sented by the figures of 100. The bulletins state that "the number 100 indicates a condition at the time of report which will give a probable yield equal to the average yield per feddan of the last ten years, where statistics are available, unless some unusual phenomena occur later." The fact is that such an estimate can only acquire value by the lapse of time, which allows of the comparison of the condition reports at various stages of previous years with the actual returns of these years.

Statistical Department.

In October, 1912, the Statistical Department, in co-operation with the Agricultural Department, commenced the publication of a monthly return showing the state and prospects of the cotton crop, which contains a great deal of valuable information. From a statistical point of view, Egypt is in a peculiarly favoured position, owing to the fact that practically the whole of the crop passes through one channel, namely, the Port of Alexandria, and that the whole handling of the crop, from the field to the ship's side, is in the hands of a relatively small body of merchants, whose interests are represented by a central organization, the Alexandria General Produce Association. Thus it is possible to put one's finger on almost every bale of cotton at four different points: (1) At the ginnery; (2) in course of transport to Alexandria; (3) in the market at Miniet el Bassal; and (4) at the steam presses where it is prepared for export. The ginneries are relatively few in number, and, as already explained, are practically all in the hands of a few large concerns. Transport to Alexandria is almost entirely confined to the State railways, the Delta light railways, and the Mahmoudieh Canal, which com-

municates with Alexandria Harbour by lock-gates, at which every boat can be enumerated. The Alexandria General Produce Association has built up an excellent system of reports of arrivals,* prices, and exports of cotton, which are published in daily and weekly bulletins, and an annual summary. The total quantity of cotton consumed in Egypt by the native hand-loom industry, or by the few steam factories in the large towns, is very small, and is estimated annually by the Association. The Association also maintains a system of correspondents throughout the country, who report regularly to them throughout the cotton season on the condition of the crop, and these reports are summarized in a monthly report published by the Association, which from about October onwards includes an estimate of the crop.

A.G.P.A.

Thus, taking the work of the Association, the Agricultural Department, and the Statistical Department all together, there is an unusually ample body of statistical material to work upon, and as the records of the two departments accumulate, the whole system should become very efficient. Already, considering the abnormal conditions of the Egyptian crop since 1909, the various published estimates have come about as near the truth as such estimates ever do.

Reference has already been made to the remarkable system organized by the government through the Irrigation Department and the meteorological branch of the Survey Department with regard to the progress of the Nile flood. The weather conditions of the enormous area which affects the Nile basin have been studied, and are

Weather and Flood Reports.

* For statistics of the arrivals and exports, see Appendix, E.

now so thoroughly understood that it is possible to obtain during the winter an approximate idea of what the next flood will be. Again, by the system of gauges on the Nile at different points along its whole course, from Abyssinia and the great lakes to the sea, it is possible to watch the rise of the river for months before it reaches Cairo, so great is the actual distance which the water has to travel. It takes about a month, for example, for the advancing flood to travel from Roseires, on the Blue Nile, to the Delta Barrage. As the date and height of the flood are the chief factors in the fate of the crop, it is therefore possible to forecast the conditions very far ahead.

Weather Effects.

It must not be imagined, however, that the Egyptian crop is entirely independent of the vagaries of the weather, though frosts are unknown, and the irrigation system practically puts the crop beyond any serious risk of drought. Thus, cold weather in March may retard germination, while occasional heavy rainstorms in April may necessitate a considerable amount of resowing, and throw the crops late. Mr. Lawrence Balls' researches have shown that the progress of the plant up to the time of flowering is very largely dependent on the temperature, especially during the night, and particularly that its exposure to excessive heat by direct sunshine has actually deleterious effects. Again, on the other hand, a cool summer with ample moisture is very favourable to the increase of cotton pests. Finally, the ultimate out-turn of the crop depends very largely upon the weather during late autumn, as fine hot weather during October and November, for example, not only tends to check excessive water-supply by evaporation, but also ripens late maturing bolls, and increases

EGYPTIAN COTTON CROP.

I.—Area, Yield, and Price, 1895-1914.

From the *Annuaire Statistique*, A.G.P.A. Bulletins, and the "Cotton Diagram."

Season.	Area.	Percentage of Total Cultivated Area.	Upper Egypt.	Lower Egypt.	Crop.	Average Yield per Feddan.	Season's Average Price. F.G.F. Brown.	Season's Average Price. Premium over American Middling.
	Feddans.		Percentage.	Percentage.	Kantars.		Pence per lb.	Per Cent.
1886	874,645	—	5·5	94·5	2,872,000	3·30	6·56	28
1887	865,396	—	7·9	92·1	2,996,000	3·45	7·12	29
Delta Barrage completed.								
1894-95	965,946	15·21	5·5	94·5	4,619,000	4·78	5·31	26
1895-96	997,735	15·51	7·0	93·0	5,275,383	5·29	6·66	37
1896-97	1,050,749	16·04	7·9	92·1	5,879,750	5·60	5·31	26
1897-98	1,128,151	16·68	8·8	91·2	6,543,628	5·80	4·44	25
1898-99	1,121,262	16·37	8·2	91·8	5,589,314	4·98	5·00	52
1899-1900	1,153,307	16·40	7·6	92·4	6,510,050	5·64	6·81	40
1900-01	1,230,319	17·18	7·1	92·9	5,435,480	4·42	6·87	33
1901-02	1,249,884	17·14	8·4	91·6	6,369,911	5·10	6·25	31
1902-03	1,275,677	17·17	8·4	91·6	5,838,790	4·58	8·44	55
Assuan Dam completed.								
1903-04	1,332,510	18·16	12·0	88·0	6,508,947	4·88	8·56	23
1904-05	1,436,709	18·94	17·0	83·0	6,313,370	4·39	7·44	52
1905-06	1,566,602	20·71	19·8	80·2	5,959,883	3·80	9·25	55
1906-07	1,506,291	20·14	16·3	83·7	6,949,383	4·61	10·37	63
1907-08	1,603,224	20·92	19·5	80·5	7,234,669	4·51	8·81	43
1908-09	1,640,415	21·59	20·8	79·2	6,751,133	4·12	8·44	53
1909-10	1,597,055	20·83	16·9	83·1	5,000,772	3·13	13·12	67
1910-11	1,642,610	21·30	19·2	80·8	7,573,537	4·57	10·75	35
1911-12	1,711,241	22·68	21·2	78·8	7,424,208	4·33	9·56	57
1912-13	1,721,815	22·42	21·8	78·2	7,532,920	4·37	9·82	46
Assuan Dam raised.								
1913-14	1,723,094	22·35	22·1	77·9	7,684,172	4·46	9·44	34
1914-15	1,755,270	—	21·8	78·2	*6,500,000*	*3·70*	—	—

II.—AREAS UNDER DIFFERENT VARIETIES, 1905-1914.

From the *Annuaire Statistique* 1914 (Sarrafs' Returns).

Variety.	1905.	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.	1914.
Afifi	1,154,923	1,163,841	1,066,720	981,428	1,052,778	1,011,343	845,665	691,910	623,737	467,350
Percentage ..	73·8	77·3	66·5	59·9	65·9	61·7	49·4	40·2	36·3	26·6
Assili ..			Not	separately	recorded.			39,836	65,958	134,104
Percentage								2·3	3·8	7·7
Ashmuni ..	293,668	224,687	299,886	321,665	251,548	292,490	329,843	344,265	356,485	353,882
Percentage ..	18·7	14·9	18·7	19·6	15·8	17·8	19·3	20·0	20·7	20·2
Nubari	Not	separately	recorded.		62,902	97,054	115,492	158,567	201,137	261,775
Percentage					3·9	5·8	6·8	9·2	11·7	14·9
Abbassi ..	34,681	25,834	37,539	60,633	24,207	22,226	33,390	36,354	37,383	12,281
Percentage ..	2·2	1·7	2·4	3·7	1·5	1·4	1·9	2·1	2·2	0·7
Jannovitch ...	72,716	84,483	156,827	237,194	199,062	209,028	250,972	239,232	173,439	127,531
Percentage ..	4·6	5·6	9·8	14·4	12·5	12·7	14·7	13·9	10·1	7·3
Sakel ..		Not	separately	recorded.			119,636	197,456	247,292	394,403
Percentage							7·0	11·5	14·4	22·4
Others	10,614	7,446	42,252	39,495	6,558	10,469	16,243	14,195	17,663	3,944
Percentage ..	0·7	0·5	2·6	2·4	0·4	0·6	0·9	0·8	1·0	0·2
Total (feddans)	1,566,602	1,506,291	1,603,224	1,640,415	1,597,055	1,642,610	1,711,241	1,721,815	1,723,094	1,755,270

most markedly the weight of the second and third pickings, as in 1910.

The most striking feature of the general economic conditions of Egypt, so far as they affect the cotton crop, is the fact, already referred to, of the enormous preponderance of small holdings owned by the fellaheen, in whom the love of the land is probably as fully developed as in any other race in the world. The following table shows the extent to which subdivision of holdings has been carried:

General Economic Conditions.

LAND HOLDING IN EGYPT.

From the *Annuaire Statistique*, 1914.

Year.	Total.			Less than Five Feddans.		
	Proprietors.	Area.	Average Holding.	Proprietors.	Area.	Average Holding.
		Feddans.	Feddans.		Feddans.	Feddans.
1900	914,414	5,114,052	5·6	761,337	1,113,411	1·48
1905	1,153,749	5,298,772	4·6	1,005,705	1,264,084	1·26
1910	1,391,964	5,463,789	3·9	1,247,081	1,369,612	1·10
1913	1,556,310	5,472,930	3·5	1,411,158*	1,418,959	1·01

* Of these 942,530 held less than 1 feddan, with an average of 0·43.

This state of affairs, which is mainly due to the Mohammedan law of equal division of inheritances, has, of course, its disadvantages. The economic position of these small-holders is inclined to be weak, with unfortunate results. Financially, they have as a rule, very little margin or reserve, and are therefore too much dependent on the small village merchant and the money-lender for their supplies and the financing of the crop, with all the resultant

Small-Holders.

touched only the fringe of the question, and he finally decided to adopt heroic measures on the lines of the Indian homestead law. The famous Five Feddan Law was therefore passed in 1912-13, which provided that no holding of less than five feddans was to be subject to seizure under mortgage, which practically meant that the owner of such a small holding could not borrow money on the security of it. As five feddans is really a very large holding in Egypt—it represents a capital value of anything from £250 to £1,000—this meant a very high limit of protection, and it naturally aroused a great deal of controversy. Finding the change inevitable, however, the country, with characteristic resignation, set itself to readjust things to the new conditions, which has apparently been done with remarkably little economic disturbance. The effect ought to be to give the fellah a new status of independence and freedom, which, however, it would be rash to take for granted. The trying experience of the war and the difficulty of financing a large part of the crop should, however, provide an interesting test of the effect of the new conditions.

The Five Feddan Law.

The price of Egyptian cotton, as will be seen from Tables F, II., and F, III., in the Appendix and the corresponding diagrams, tends on the whole to follow that of American, though not so closely as the Indian price. But while Egyptian cotton has of late years shown an occasional tendency to break away from the leading-strings of American, it never seems to be able to do so for very long at a time. Thus, during the boom of 1905-1907, the price of Egyptian cotton rose, as already mentioned, to

Photos by

CARRYING A 400-LB. BAG OF COTTON UP TO THE GIN ROOM.

A. S. Pearse.

A GOVERNMENT HALAQA OR VILLAGE COTTON MARKET.

the excessive premium of 63 per cent., but was quickly dragged back again by the crisis of 1907-08 to 43 per cent. Again, in 1909-10 the record premium of 67 per cent. was immediately followed by a relapse in the following year to 35 per cent. This, however, only represented the disparity of the American and Egyptian crops in 1910, the latter being very large and the former comparatively small. The movements of the price of Egyptian since the outbreak of the war, which are more fully dealt with in Chapter XX., again show the same tendency, a sharp rise of the premium to nearly 60 per cent. being quickly checked, and followed by a relapse to less than 30. It is, therefore, obvious that the price of Egyptian cotton is primarily influenced by the price of American, and only secondarily by the amount of the Egyptian crop. This is conclusively shown in the diagram on p. 440 by plotting out the quantity of the Egyptian crop from year to year, and the average price of the subsequent season. The diagram shows only occasional correlation between the crop and the price curves, in striking contrast to the case of the American crop, as shown in the diagram on p. 101. There is no doubt that the possibility of substituting long staple American for Egyptian cotton referred to on p. 223 has materially contributed to this result since 1909.

Conclusion.

To sum up, while all is not well with the Egyptian crop, its position and prospects are on the whole, perhaps, more satisfactory than that of any other country in the world. It is a small crop, but of very great value—£30,000,000 worth per annum produced from less than 2,000,000 acres, which incidentally produce

other crops during the twelve months sufficient to cover the whole cost of production of the year's crops, giving a sheer surplus of, on the average, £20 an acre. No wonder that rents are high; £10 to £15 per acre per annum is quite a common figure; and the price of good cotton land is anything from £100 to £200 an acre. Such prices amply justify the enormous sums which are being spent by the government on irrigation and drainage. The possible reclamation of 1,000,000 acres, and the improvement of the average yield as the result of improved drainage, a better seed-supply, and more long-sighted methods of cultivation, make the possibility of doubling the present crop, and considerably improving its average quality, seem perfectly feasible.

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CHAPTER XV

THE ANGLO-EGYPTIAN SUDAN

Great possibilities, enormous area, variety of conditions—Present areas: Tokar, Kassala, Khartoum, Gezira, Southern provinces —Irrigation *v.* rain-grown cotton—Egyptian and American —Irrigation schemes, Blue and White Niles—Population.

As a cotton-growing country Egypt has only one irremediable fault, its restricted area. Four million acres will probably be the absolute maximum that can ever be brought under cotton. No such fault can be found with the Sudan, the geographical area of which is no less than 1,000,000 square miles, or half as big again as the whole American Cotton Belt. It is not, of course, implied that the whole of this area is, or ever will be, cultivable, but owing to the rainfall in the greater part of the country being considerable, the proportion of cultivable area to desert land is enormously greater than in Egypt.

Area.

In such an area, which practically represents a small continent in itself, and extends through 17 degrees of latitude, there is naturally a great range of climate. North Sudan, from a little below Khartoum to the Egyptian boundary at Wady Halfa, is practically rainless. At Khartoum there is a short rainy season during the summer months, but the climate during the rest of the year is very dry, and cultivation is impos-

Climate.

sible without irrigation. South of Khartoum a region of tropical rainfall extends to the southern borders of the country, where the Sudan marches with Uganda and the Belgian Congo. Thus at Khartoum the rainfall is about 4 inches per annum; at Roseires, on the Blue Nile, near the Abyssinian border, about 32 inches; at Gondokoro, on the White Nile, on the very borders of Uganda, the rainfall is fully 35 inches; while at the Albert Nyanza it is about 48 inches.

The cotton possibilities of the country fall under two heads—irrigation in the north, and rain-grown cotton in the south. The former is of the greater importance in the meantime. It includes four entirely separate areas, none of them as yet large, but one of them, the Gezira, promising great developments at an early date. Before dealing with that, however, the other three may be briefly referred to.

Irrigated Areas.

On the Red Sea, about eighty miles south of Port Sudan (the new outlet of the Sudan near Suakin), is the district of Tokar, watered by the River Baraka, which comes down once a year in heavy flood, like the Blue Nile from Abyssinia into Egypt. The area available for cotton growing depends entirely on this flood, for although the rainfall on the Red Sea coast is greater than inland (about 6 inches at Tokar), this would not be sufficient to carry a crop, as the rainy season does not generally begin before the end of October. The unfortunate thing is that the flood in the Khor Baraka between July and September is almost uncontrollable; a great deal of it runs to waste, and the river has a very

Tokar.

Photos by *A. S. Pearse.*

1. A COTTON-FIELD NEAR KHARTOUM NORTH.
2. PRIMITIVE WELL-GEAR IN THE SUDAN.

Photo by *A. S. Pearse.*

Photo by *J. Arthur Hutton.*

1. THE BLUE NILE FROM TAYIBA PUMPING STATION.
2. BALING COTTON IN THE GEZIRA.

awkward habit of changing its channel and running into different districts in different years. The result is, of course, that the natives cannot be expected to do much in the way of preparing the ground for the crop until they see how the river means to go. A flood-controlling scheme has been drawn up which would guarantee a water-supply to an area of 70,000 to 80,000 feddans (acres), but so far funds have not been available for undertaking such permanent work. Hitherto the largest area recorded as having been cultivated was 53,568 feddans in 1910-11; of this 47,010 feddans were under cotton, and produced a crop of just under 50,000 kantars (of 100 pounds) of lint cotton.

Water-Supply.

The methods of cultivation are very primitive. The labour-supply is, of course, entirely native, and is supplemented every year by pilgrims on their way from all parts of Africa to Mecca, who will often put in a season in this neighbourhood, and earn some money to carry them on their way. The average yield of cotton is only about 100 pounds of lint per feddan, but its quality is very satisfactory, especially in point of strength. Afifi is the only kind of cotton grown.

Labour.

But the outstanding feature of the Tokar crop is the stringent regulation by government of the seed-supply and the disposal of the crop, under the Cotton Ordinance of 1912. A special staff of watchmen is maintained to enforce the provisions of the Ordinance as to clean picking of the cotton. All Hindi or other inferior plants must be weeded out of the fields. The whole crop of the district must pass

Government Regulation.

through the government cotton markets, where the government classifier grades it into four classes, paying special attention to the cleanliness of the cotton and uniformity of staple. No cotton is allowed to leave the country unginned, except by land to Abyssinia and Eritrea, and the government controls the disposal of the seed in the ginneries, and especially the selection of seed for the next year's crop.

This system of benevolent despotism is calculated to arouse very mixed feelings in the minds of the cotton growers and government officials of other cotton-growing countries, especially the United States; but whatever may be thought of it from the political point of view, it has at least established the quality of Tokar cotton in the European markets, and gained for it already a reputation for quality which is of no small value.

So far, the chief drawback to the development of Tokar has been the difficulty of transport. The whole crop is concentrated at Tokar, from which it is carried twenty miles by camel to the port of Trinkitat, thence by small native sailing-boats to Suakin. The provision of a railway from Tokar to Suakin or Port Sudan can only be a matter of time, and it is hoped that funds will be available for this purpose out of the £3,000,000 loan recently negotiated by the Sudan Government, and which is to be guaranteed by the British Government. There is a ginnery at Suakin, but the most of the crop used to be sent for sale to Alexandria. It is intended, however, to develop a direct trade from Port Sudan to Europe. Since 1914 the import of unginned Sudan cotton into Egypt has been prohibited.

Transport.

Kassala lies between Khartoum and the Red Sea, on the Khor el Gash, which ought to be a tributary of the Atbara River, but actually never reaches the latter. It is about a fortnight's journey from the nearest railway station, as it lies on the very border of Eritrea, the Italian Red Sea province. The conditions are very similar to those at Tokar, the river flooding the country between July and September. The rainfall is about 16 inches per annum, but it unfortunately coincides with the flood. The methods of irrigation employed differ very greatly, some resembling basin irrigation, and others perennial, the canals being fed by pumping. The cotton grown is mostly Afifi, with smaller quantities of other Egyptian varieties, but there has been some mixture with American varieties carried across the borders from Eritrea. Some of the cotton is exported to Eritrea, but most of it goes to Port Sudan. Altogether, the crop is estimated at about 4,000 kantars (of 100 pounds) of seed cotton; but it is said that this in no way represents the possibilities of the district, there being 120,000 acres of land suitable for cotton. Transport, again, is the stumbling-block, and it is not known yet whether the government will decide to proceed first with this line or that from Suakin to Tokar.

Kassala.

On the Nile itself, north of Khartoum, are a number of small areas growing cotton under irrigation by pumping from the Nile, the rainfall of 4 inches per annum being entirely insufficient. The chief of these is the Sudan Plantations Syndicate's estate at Zeidab, in the province of Berber, 181 miles north of Khartoum, which contains about 10,000 feddans, more

Zeidab.

than three-quarters of which are now under cultivation, including about 2,800 feddans under cotton. The land is let out to natives in holdings of about 30 feddans. The chief drawback to this district is its liability, between November and January, to very cold night winds, sometimes following a hot day, which do great damage and introduce a speculative element into the crop, the average yields in different years having varied as much as from 1 to 4 kantars. All the different varieties of Egyptian cotton have been tried, the best success having been attained with Nubari and Afifi, and experiments have also been made with American long staple varieties. The cotton season is from May or June to January or February, and the proprietors insist upon careful methods of cultivation and picking being followed by the native tenants. The Syndicate buys the cotton from the natives and owns the ginnery, which also handles some cotton from surrounding smaller estates. The Syndicate also supplies selected seed at cost price. The estate is convenient to the railway, but the transport charges to Alexandria, and thence to Liverpool, are, of course, heavy.

Gezira.

But the chief hope of cotton growing in the Sudan in the immediate future lies in the district known as the Gezira, meaning literally "the island," lying south of Khartoum, between the Blue and White Niles. It is an enormous plain of about 4,000,000 acres in extent (more than twice the total area at present under cotton in Egypt), almost all of it possessing excellent soil for cotton growing. Though apparently absolutely flat, the whole of this area has a steady but gentle slope, sufficient for irrigation purposes, from the

'hoto by J. Arthur Hutton.

'o by A. S. Pearse.

1. ON THE BLUE NILE AT WAD MEDANI.
2. WOMEN LABOURERS IN THE SUDAN.

Blue Nile to the White Nile. The scheme for its development consists of a main irrigation canal, leaving the Blue Nile at Sennar, and running northwards parallel to the course of the river. The rainfall being only from 4 inches to 16 inches per annum, cultivation is almost entirely dependent on irrigation.

Tayiba.

It is proposed in the first place to begin with an area of about 500,000 acres lying along the west side of the Blue Nile from Wad Medani northwards. The main south line of the Sudan Government railways runs the whole length of this tract. As a preliminary experiment, the government in 1911 started a test farm at Tayiba, with a pumping installation to supply the water for irrigation. The management of this experiment was handed over to the Sudan Plantations Syndicate, the owners of Zeidab, and the result has been entirely satisfactory. The land is let out in small holdings to the natives, and the Syndicate distributes seed and enforces proper methods of cultivation. The varieties chiefly grown so far have been Afifi and Nubari, and the average yield is very high—over 500 pounds of lint per acre. The Syndicate owns the ginnery and press at Wad Medani, and they buy the cotton from the tenants.

Future Prospects.

The success of Tayiba has clearly established the possibilities of cotton growing in the Gezira, and work has now been commenced on the barrage at Sennar, and the main irrigation canal. It must, however, be a considerable time before we can look for any very substantial amount of cotton from the Gezira. The execution of these great irrigation works will itself take several years, and even then the

development of a large area is inevitably slow. Further, there is one limiting factor which renders rapid progress impossible, namely, the labour-supply. Before the wars with the Khalifa the population of the Sudan is believed to have been 10,000,000; but the Khalifa's summary methods of dealing with those who refused to join his standard, and the no less effective methods of our own army in dealing with those who did join him, wiped out probably four-fifths of the whole population, with the result that after the Battle of Omdurman, in 1898, the total population did not exceed 2,000,000. The dearth of adult males especially is emphasized by the fact that a large proportion of the labourers in the Sudan to-day are women.

Population.

Since the reconquest of the Sudan, the population has, of course, increased with Oriental rapidity, and it is believed now to be over 3,000,000. But even if this rate of increase is maintained, a good many years must elapse before the population will be sufficient to provide for the cultivation even of the 500,000 acres included in the first instalment of the Gezira scheme, if the quantity of labour necessary is to be judged by the experience of Egypt. A comparison of the figures of the area and population in Egypt throws a good deal of light on the question. The total area under cultivation in Egypt now is about 5,000,000 feddans, of which about one-third (1,750,000) is in cotton, and the population, which is almost entirely agricultural, is about 15,000,000, or an average of three to the acre, or nearly nine to the acre under cotton. The Egyptian fellah is a trained cotton cultivator, with several generations of experience behind him, while the Sudani is barely one generation removed from the bar-

barian.* With the exception of a relatively small number in the existing cotton areas, he has the whole business of cotton growing to learn, though it is only fair to add that experience at Tayiba shows that if he is put alongside one who has had experience of cotton growing he is extraordinarily quick to learn. But making every allowance for this, the present population of the whole of the Gezira is less than 500,000, as against the 1,500,000 to 4,500,000 which, on the Egyptian standard, will be required to cultivate the proposed 500,000 acres. Increase by immigration can only be relatively slow, because there is no surplus population in the rest of the Sudan to be drawn upon for the purpose, and to induce the Egyptian fellah to emigrate to the Sudan is almost impossible; for the Sudan has always been the Siberia of Egypt, the terrible land of exile from which no traveller returns. This prejudice will disappear in the course of time, but it will not be a short time; and in the meantime the population of the Sudan, in spite of its rapid natural increase, cannot be expected to supply the labour for the area which we would like to see under cotton. It is better, therefore, to face the facts, and to realize that, while the Gezira offers perhaps the most brilliant future for cotton growing of any part of the British Empire, these prospects are not likely to materialize in a really large quantity of cotton—say 1,000,000 bales—within the next ten or fifteen years.

The possibilities of rain-grown cotton in the southern portion of the Sudan are also very good, but not immediate. There is no doubt that good cotton can be

* But see Sir Reginald Wingate's preface to A. S. Pearse's "Cotton Growing in the Anglo-Egyptian Sudan," as to early cotton growing there and the population question.

grown, though the American type is likely to prove more suitable than the Egyptian, on account of its earlier maturity. The possible area is said to be very large —no one really knows how large; but all the conditions necessary for its development are still to be provided, especially transport and labour-supply. The crop so far has never exceeded 5,000 bales, and its quality is said to be superior to American middling. But the development of the Gezira will strain the resources of the Sudan to the utmost limit for a good many years to come, and the south will probably have to wait. Even if Great Britain were prepared to follow the precedent of the £3,000,000 loan by many more loans of larger amounts to supply the capital necessary for the development of this enormous area, it would be practically useless without the labour-supply. Nothing could be more harmful to the real interests of the Sudan than the creation of an excessive demand for labour, which would only result in a rise of the labour cost of the crop, and might strangle the industry. Things must go slowly in the Sudan if the best results are to be achieved in the long-run. The results already attained in fifteen years have been marvellous, but it must not be forgotten that the area of the Sudan is ten times that of the British Isles.

Rain-Grown Cotton.

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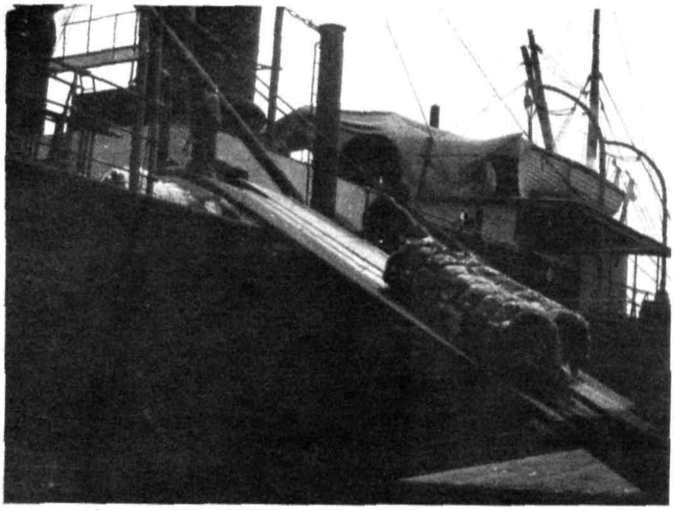
N.B.—For statistics of the Sudan Crop see under Africa, p. 200.



1. LOADING UPLAND COTTON AT SAVANNAH.
2. BALES OF SEA ISLAND COTTON AT SAVANNAH.

CHAPTER XVI

SEA ISLAND COTTON

South Carolina, Florida, and Georgia: different grades and values—Crop figures—Egyptian competition—Boll Weevil—West Indian crop, British and foreign.

SEA ISLAND cotton is practically confined to two areas, the southern portion of the Atlantic States (South Carolina, Georgia, and Florida) and the West Indies. It is an entirely different variety of cotton from the American Upland, and, as its name (*Gossypium barbadense*) indicates, its original home was in the West Indies. It is said to have been brought to Charleston in 1786 via the Bahamas,* and the best of it has been grown on the islands, such as James, Edisto, Wadmalaw, and John's, near Charleston, ever since. Later on it spread to the mainland, and considerable quantities were grown from Sea Island seed in certain well-defined districts near the coast of the three states named. It is generally supposed that Sea Island cotton will not grow anywhere except near the sea, and it is certainly a fact that the crops known as Floridas and Georgias are never so good as the original "Islands" cotton, although the seed is frequently renewed from the original source.

Home of Sea Island.

* See Baines' "History of the Cotton Manufacture," p. 294.

The total quantity of the crop is relatively very small, seldom over 100,000 bales (of about 400 pounds each), and the amount fluctuates very greatly. As will be seen from the table on p. 328, the record crop of 122,866 bales in 1911 was followed by a miserable failure in 1912, when the crop only amounted to 68,163 bales. The distribution of the crop among the different grades is as follows: The Carolina Islands crop averages about 10,000 to 12,000 bales. Of these about 4,000 bales are what are known as crop lots. "They are grown by men of great experience, who have been settled in the district for many years, whose estates have descended from father to son, and who thoroughly understand their business. They have a name for their crops, and can sell their crops on the strength of the name on the bales. Sometimes they can get several pence extra for the name alone. The other 8,000 bales is what is called graded cotton. It is grown by small planters; it is graded by the factors, made into lots of 50 or 100 bales, and shipped over in that form." There are also about 40,000 bales of Florida Sea Island cotton, and 45,000 bales of Georgia. The quotation is from a speech made by Mr. C. M. Wolstenholme at a conference arranged by the British Cotton Growing Association in 1908. At that time the relative values of these grades were as follows: Georgia, 12½d. to 13d. for the best quality; Florida, 14d.; Graded Islands, 14½d. to 15d.; and crop lots 16d. to 24d., according to quality. Since then there has been a slight alteration in the relative values of Georgias and Floridas. The former have improved, while the latter have, if any-

Distribution.

Different Grades.

thing, deteriorated, with the result that the two are now frequently quoted at the same price.

Probably the worst feature of the Sea Island cotton from the growers' point of view is the extraordinarily speculative character of the market, and the extreme fluctuations of the price. It seems to be impossible to estimate the price six months ahead to within 50 per cent. This is partly due to the fluctuating quantity of the crop, but also to the very specialized nature of the demand. The high price restricts the use of Sea Island to those branches of the cotton trade where extreme fineness of the yarn is essential, such as the lace trade. These goods, being of the character of luxuries, seem to be more liable to fluctuations in the demand, either through depression of trade or change of fashion. But unless a very high price can be secured, Sea Island cotton does not pay the growers, for it is a most troublesome and risky crop, requiring long experience and very special care, and it is peculiarly susceptible to damage by unfavourable weather. The failure of the 1912 crop, for example, was due to a severe hurricane which devastated the whole of the Sea Island district, and cut down the crop to almost one-half of the normal. A similar storm in 1911, which affected South Carolina only, cut down the yield for that state from 13,338 bales in 1910 to 5,140 for the following year.

Price Fluctuations.

Risky Crop.

Within the last few years, again, the situation has been still further complicated by the appearance of a new competitor in the form of certain superior varieties of Egyptian cotton, namely, Abbassi, Voltos, Jannovitch,

and Sakellarides (commonly known as Sakel). The first named of these is a fine white cotton, which came into

Egyptian Rivals.

this market about fifteen years ago, and was speedily found suitable to take the place of the lower grades of Sea Island, though not so long or fine in staple, nor so strong as the real Islands. Voltos is also white, but finer and longer than Abbassi. Jannovitch and Sakel are light brown cottons of about $1\frac{3}{4}$-inch staple, but possessing great strength, and they have proved very serious competitors to Georgias and Floridas, particularly in the sewing-cotton trade, of which the latter had almost a monopoly. In 1912-13, for example, when the failure of the Sea Island crop should have sent prices up to a very high level, which might have recouped the Florida and Georgia growers for the failure of the crop, there was an abundant crop of these Egyptian varieties, especially Sakel, available at moderate prices. The Lancashire spinners had been using the Egyptian types ever since they came on the market, but the American mills had not yet found it worth while to do so to any

Effect in 1912–13.

great extent. The difference in price, however, forced them to follow the example of Lancashire, with the result that the imports of these classes of Egyptian cotton into America in 1912-13 were nearly double those of the previous year.* The natural effect of this was to prevent the expected rise in the price of Georgias and Floridas, to the very serious loss of the growers. It is said, however, that many of the American spinners did not find the new

* So the writer was informed, but no statistical confirmation is available.

1. COTTON PICKERS RETURNING FROM THE FIELDS.
2. COTTON COUNTRY, ST. VINCENT, WEST INDIES.

From photographs kindly lent by J. Arthur Hutton

Egyptian cottons at all suitable to their requirements, perhaps through lack of experience in handling them, and that most of them would return to the Sea Island if the supply was available at a reasonable price.

The position of the Sea Island industry is therefore not at all satisfactory, and there have been frequent threats by some of the growers that they would abandon it in favour of the ordinary American Upland. Large quantities of this are already grown in the same states as the Sea Island, and, although its value is so far below that of the latter, it is a much easier and less uncertain crop.

Boll Weevil Prospects.

There is, however, a greater danger ahead, which may prove the entire undoing of the Sea Island crop in America, namely, the approach of the boll weevil. As will be seen from the map at p. 104, it had actually crossed the frontier of the Sea Island country in Florida in 1913, and no hope can be held out that its progress here will not be as steady and as rapid as elsewhere. Indeed, there is reason to fear that the conditions in this part of the Belt will prove specially favourable to the boll weevil, owing to the mild and humid climate, the mitigation of the winter frosts by the proximity of the sea, and the luxurious undergrowth with which the whole country is covered. The possibility must therefore be faced that in the course of the next five years the boll weevil will overrun the most of the Sea Island district. The consequences can hardly fail to be absolutely disastrous, for Sea Island is very late maturing, the latest of all, and its cultivation under boll weevil conditions will be simply impossible. No one has even suggested the possibility of breeding an early

maturing Sea Island, which might hope to evade the boll weevil. As far as present knowledge goes, the situation is almost desperate, though, of course, there is always the possibility that before the disaster is accomplished some new means may be discovered of combating the pest. In the meantime, however, the fact must be faced that the American supply of Sea Island cotton may be very seriously curtailed within the next five years.

West Indies.

There is only one other country, in the meantime, to which the trade can look for any supply at all of the best Sea Island cotton, namely, the West Indies. Quoting Mr. Wolstenholme again (in 1908), of the total crop of, say, 7,500 bales of Sea Island produced in the West Indies, about 1,500 are equal to crop lots of Islands cotton. They are grown chiefly in St. Vincent, some in Barbados, and some in St. Kitts. Of the remainder, about 4,000 bales are considered equal to graded Island cotton, and the remaining 2,000 to Florida and Georgia. There is also a quantity of lower grade cotton, known as Marie Galante, a wild type of native cotton, believed to be related to the true Sea Island, but of inferior staple, which amounts to well over 1,000 bales.*

Early History.

The history of cotton growing in the West Indies shows many strange ups and downs. Columbus found cotton growing in Barbados on his first landing, and it is probable that it was from the West Indies that cotton was first carried by Europeans to the American colonies. Until near the

* The Hayti crop is of a still lower type, and is not included in these figures (see p. 326).

end of the eighteenth century, practically the whole of the cotton used in England came from the West Indies. During the nineteenth century, however, the industry seems to have died out almost entirely, under the competition of American grown cotton, and its revival in the early years of the twentieth century is due almost entirely to the work of the British Cotton Growing Association. Their success here has been so great that it would almost have justified the foundation of the Association, even if they had done nothing anywhere else.

As will be seen from the map at p. 324, the West Indies extend over a wide area, though not many of the islands are of great size. They may be roughly divided into the following groups: (1) The Bahamas, which lie to the north of Cuba, and extend to near the Florida coast. (2) The Greater Antilles, including Cuba, and Jamaica which lies to the south of it, the republics of Hayti and San Domingo, and Porto Rico, which now belongs to the United States. Farther east, the Lesser Antilles are divided into two groups—namely: (3) The Leeward Islands, of which the chief, from the point of view of cotton growing, are St. Kitts, Nevis, and Anguilla, Montserrat and Antigua. The French Islands of Guadeloupe, Marie Galante, and Martinique, the Danish Islands of St. Thomas and St. Croix (Santa Cruz) in the Virgin Islands, and the Dutch colonies of St. Martin's and St. Eustatius, may also be mentioned. (4) The Windward Islands, including St. Lucia, St. Vincent, and Grenada, with Barbados lying about sixty miles farther east. Tobago and Trinidad, the southernmost of the islands, lie close to the coast of

Geography.

Venezuela, on the South American mainland. Farther west, again, and close to the Venezuela coast, lies the Dutch island of Curaçoa.

The following notes on the various islands are based chiefly on the published reports of the British Cotton Growing Association and on Consular and Colonial Reports.

Reversing the geographical order of the above description, Trinidad, apparently, does not possess conditions favourable to the growth of Sea Island cotton. The air is very heavily charged with moisture, which, in conjunction with the high temperature, seems to injure the plant, while other crops are found more profitable. This seems regrettable, as Trinidad is one of the largest of the West Indian Islands, containing an area of about 1,750 square miles, or nearly as much as all the other cotton-growing islands in the Lesser Antilles put together. It may be hoped, therefore, that in course of time suitable types of cotton will be found which will make cotton growing a success in this large area.

Trinidad.

Tobago is under the same local government as Trinidad, from which it lies about twenty miles north-east. Its area is over 73,000 acres, or about 114 square miles. About half its area consists of hills and well-watered valleys, and is known as the cacao district, while the rest is flat and well suited to cotton growing, the rainfall being about 50 inches per annum. This seems to be about the right amount for cotton growing, though in St. Vincent, where the best cotton is grown, there is nearly twice as much; but it seems to do no harm, on

Tobago.

account of the extremely porous nature of the soil of that island.

Tobago was one of the last of the West Indian Islands to start the cotton industry in modern times. The labour-supply does not seem to be so good as elsewhere, as the labourers prefer to work on their own small plots, from which they derive the bulk of their food-supply. Tobago, however, in taking up cotton growing, is only reverting to former conditions, for it is recorded* that in 1780 it produced more than 2½ million pounds, or nearly as much as the whole present crop of the West Indies, and wild cotton still grows everywhere in the cotton district. Both

Hybrids.

Marie Galante and Sea Island cotton have been tried in Tobago, but the industry has certainly not been such a success here as it has been in other islands. In fact, the experiments with Sea Island cotton were described in 1912 as an absolute failure. In 1911, however, experiments were being carried on with a hybrid cotton produced by crossing Sea Island with Marie Galante, which seemed to promise a very heavy yield of fairly good cotton, and it was hoped that this cotton might also prove suitable for Trinidad. No further progress seems, however, to have been made in this direction.

Grenada.

In Grenada, also, cacao has to some extent ousted cotton growing, but both there and in the small neighbouring island of Cariacou, Marie Galante cotton has been grown for a good many years to the amount now of nearly 1,000 bales, and efforts are also being made to introduce pure Sea Island.

* B.C.G.A. Report No. 29, Appendix F.

St. Vincent produces the best of all the Sea Island cotton grown in the West Indies, yet the first attempt with the crop was only made in 1904. At that time the island was in a very depressed condition as the result of a destructive hurricane in 1898, and volcanic eruptions in 1902 and 1903. The chief product of the island was arrowroot, for which prices were proving unsatisfactory, and the introduction of cotton proved the salvation of the island. The average yield here has been as high as 145 pounds of lint per acre, and this, with the high quality for which St. Vincent cotton is distinguished, ought to be a profitable crop. The yield, however, seems to be diminishing here also, as in other parts of the West Indies, though it is probable that better methods of cultivation will check this decline. The labour-supply may prove a difficulty, as the people are already fully employed; but the rate of wages is very low, as it is throughout all the islands, seldom exceeding 1s. a day for men. It seems difficult to account for the extraordinary difference between this and the state of affairs in America, where wages average at least four times as much. It is hoped that the completion of the Panama Canal works will remedy this shortage of labour, and as an indication of the extent of the demand for labour on the Canal works, a statement, made in 1912, may be mentioned, that a sum of £100,000 annually of wages earned on the Canal was being remitted to Barbados alone.

St. Vincent.

The island of St. Vincent is only 133 square miles in extent. The soil is mostly volcanic, and the surface is broken by rocks and ravines, so that mechanical appliances

are not of much use in agriculture; hence the necessity for an ample labour-supply. Large numbers of the natives own their small holdings; and cotton is grown as a main crop for its own sake, not only as a catch crop between two sugar crops, as elsewhere. The area under cotton is said to average about 5,000 acres.

Area and Crop.

As will be seen from the table on p. 329, the total crop has been as high as 1,345 bales in 1911, though the season of 1912 was not so successful. This shortage in 1912, however, was general throughout all the islands, and also, as we have already seen, in the American Sea Island districts.

Barbados, though only possessing an area of 166 square miles, for a time stood at the head of the list in the production of cotton in the West Indies; but since 1908 it seems to have fallen away considerably, and in 1912 its total output was exceeded by that of St. Vincent. The island is flat and practically all under cultivation. The soil is very shallow, only about 6 to 10 inches overlying a porous coral rock. The natives cultivate sugar chiefly, and cotton is as a rule only grown as a rotation crop. The development of cotton growing in Barbados seems to have been seriously hampered in the last few years by an estrangement between the Imperial Department of Agriculture and that of the local government, and by the traditional unwillingness of the Barbadians to adopt new methods. The average yield per acre seems to be decreasing. In 1908, 127 pounds per acre was spoken of as an exceptionally high yield; but in 1912 a further

Barbados.

Declining.

report speaks of it as only 100 pounds per acre, and this only by allowing the plant to resume its growth in the spring, so as to get a second crop. If this state of affairs continues, cotton growing can hardly prove sufficiently remunerative to make it worth while to continue, or at least to extend the industry. It is rather paradoxical that this should be the case in Barbados, from which Sea Island cotton takes its name.

St. Lucia.

The cultivation of Sea Island cotton in St. Lucia is on a comparatively small scale; the maximum export recorded was forty-four bales in 1910. The chief difficulty seems to be the insufficiency of the labour-supply, due to the emigration of the natives to the gold-fields of Cayenne (French Guiana) and the Panama Canal.

Guadeloupe.

Of the French islands, Guadeloupe is apparently the only one of any importance with regard to cotton growing. The French Colonial Association has made great efforts to encourage the cultivation, but the crop seems never to have reached 100 West Indian bales.

Montserrat.

Passing north to the Leeward Islands, which produce among them nearly half of the total West Indian Sea Island crop, Montserrat, which was one of the first of the islands to grow Sea Island cotton on a commercial scale, comes next to Barbados and St. Vincent in the quantity of the crop. The decline of the sugar industry and the hurricane of 1899, which destroyed the lime-juice trade, had reduced the island to a very low ebb in 1900, and in 1901 experiments were begun with cotton. Its early years in cotton growing,

however, were very unfortunate, on account of insect pests; but since 1905 there has been a marked improvement in the methods of cultivation and seed selection, with excellent results. The rainfall is less than in St. Vincent, but the soil more open, though mostly of the same volcanic character. Here, also, a considerable area is under cultivation by peasant proprietors, and though not a popular crop, on account of the amount of care and attention it requires, cotton is recognized as being very profitable, and a good deal of scrub-land is being cleared and put under it.

St. Kitts.

The three islands of St. Kitts, Nevis, and Anguilla are under one government, and produce among them well over 1,500 bales. St. Kitts has been called the Treasure Island of Agriculture. Its soil is so good that it excels all others in the quality,* as well as the quantity, of its products. Cotton, however, is only grown as a catch crop in rotation with sugar, and as the interval between the two sugar crops is only about eight or nine months, the cotton is often pulled up before the whole of its crop is ripened; yet, even under these conditions, a crop of 300 pounds of lint per acre is said to be quite possible. There are no peasant proprietors in St. Kitts, the system being disliked by the planters and large owners.

In the island of Nevis the conditions both of soil and climate are less favourable. There are great numbers

* Except the very best cotton grown in St. Vincent, which fetches 30d. to 40d. per pound. But the finest of the St. Kitts and Antigua cotton is better than the ordinary run of St. Vincent.

of peasant proprietors, and as the cultivation of sugar is said to be falling off, efforts are being made to extend the cultivation of cotton. Nearly 1,000 bales per annum is mentioned as a normal crop.

Nevis.

Anguilla.

Anguilla is a small island, lying about sixty miles north of St. Kitts, and is described as having been redeemed from poverty entirely through cotton. Cotton growing has been taken up with great spirit, and on a small scale has been very successful. According to Baines, it was from Anguilla that Sea Island Cotton was first taken to the Bahamas.

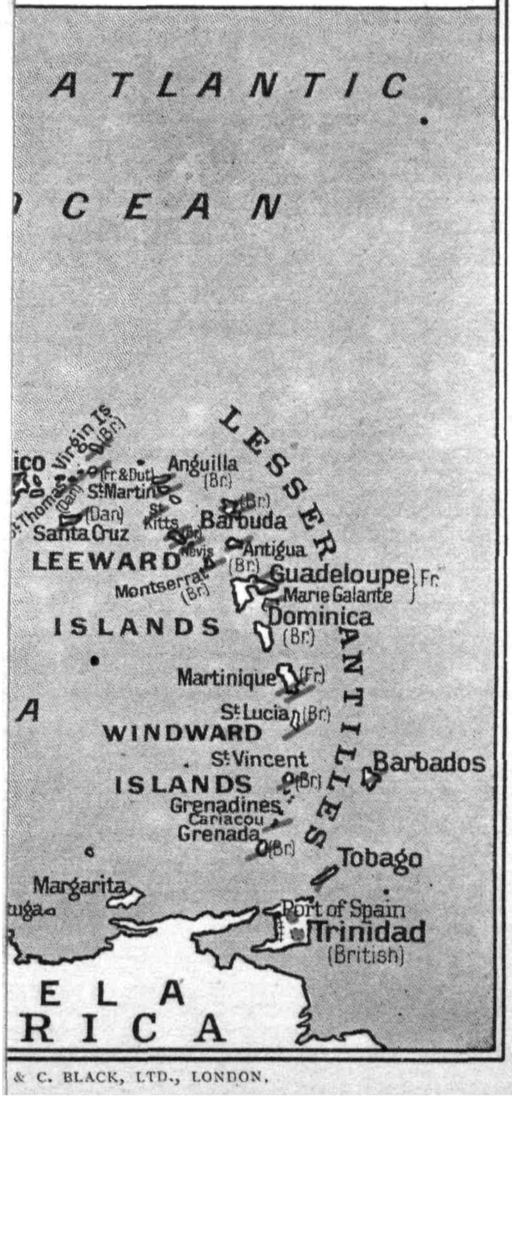
Antigua.

Antigua is the government centre of the Leeward Islands, and here cotton has been adopted as a rotation crop with sugar. The conditions, however, do not seem so favourable for cotton, as the rainfall is under 50 inches, and droughts are frequent. In 1907 great damage was done by a special cotton pest The quality is, however, very good, and it is said that a large increase in the crop may be expected from Antigua and the neighbouring island of Barbuda within the next few years.

Virgin Islands.

The last of the Leeward Islands is the group known as the Virgin Islands to the north, most of which are British. The conditions of the cotton industry in these islands are peculiar, in that it is entirely carried on by peasants and small growers, and the relation of the government to the cotton growers is unusual. These small holders having no facilities for marketing and exporting their crop. the seed cotton is bought from them by the government, which undertakes the ginning, grading, and exporting

COTTON GROWING DISTRICTS



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crop goes to the United States, to which the island belongs.

Hayti and San Domingo.

The two republics of Hayti and San Domingo, which between them occupy one of the largest of the West Indian islands, produce a large amount of comparatively low-grade cotton, which seems to be indigenous to the island; but owing to frequent political changes, and the chronic state of unrest and lack of security, the industry has certainly not developed as it ought to have done. The quantity produced in Hayti alone is apparently about 10,000 bales, if the statistics are to be trusted; but, though the staple is said to be long, the quality is poor, and the cotton is described as badly prepared and packed, with the result that its price is very low, in fact, not the price of Sea Island at all. As far as one can unravel the intricacies of the foreign exchanges and the value of the local paper money, the price seems to be about 6d. per pound. Small lots of so-called Sea Island grown in San Domingo in 1911-12 fetched only 10d. per pound, the price of the best Brazilian. There is little doubt, however, that the island is capable of much better things if the political conditions were even tolerably satisfactory.

Cuba.

In Cuba some cotton has been grown experimentally, the result being described as Sea Island cotton of the finest quality. Previous experiments had failed, owing to the presence of boll weevil.

Jamaica.

In Jamaica, which is one of the largest and most prosperous islands of all the group, the first efforts to establish cotton were not a success; but renewed efforts were made, which seem to

have given more satisfactory results. The 1912 crop, though still under 100 bales, is the largest recorded.

Bahamas.

The total growth of the Bahamas is also very trifling—only about 30 bales per annum.

Cotton Pests.

The principal insect pests of cotton in the West Indies are the cotton worm, the leaf-blister mite, the cotton aphis, and the flower-bud maggot. As Sea Island cotton is a very tender plant, it is readily attacked by, and suffers severely from insect pests which do not cause much injury to the wild varieties of native cotton. Of these pests, the flower-bud maggot seems to be confined to Antigua and Montserrat, where at times it does great damage. The leaf-blister mite first appeared in Montserrat in 1903, and seems to be peculiar to the West Indies.

Ginning.

Most of the ginneries in the British West Indies are owned privately, though many were erected in the first instance with the assistance of the British Cotton Growing Association. The first ginnery was erected by the Imperial Department of Agriculture, with the aid of the Association and a local society, in St. Lucia in 1901. Soon after the revival of the industry, government ginneries were started in Antigua, Barbados, St. Vincent, and Tortola (Virgin Islands). The first two have since been taken over by private companies. In St. Vincent and Tortola the ginneries are supervised by the officers of the Imperial Department of Agriculture.

Except in St. Vincent, the cotton is pressed by hand or power presses into bales. In St. Vincent, however,

SEA ISLAND COTTON.

I.—American Crops, 1882—1914.

In 400-lb. Bales.

From the Liverpool Cotton Association's Annual Circular.

Year.	Florida.	Georgia.	South Carolina.	Total.
1882	18,054	3,126	15,744	36,924
1883	14,073	2,956	8,415	25,444
1884	24,987	3,075	12,863	40,925
1885	24,272	6,390	7,010	37,672
1886	30,991	6,411	7,735	45,137
1887	24,753	6,254	8,564	39,571
1888	26,909	7,462	9,532	43,903
1889	25,111	12,431	9,299	46,841
1890	25,320	26,531	16,267	68,118
1891	20,628	27,100	11,443	59,171
1892	9,685	28,324	7,413	45,422
1893	19,107	39,367	2,578	61,052
1894	15,176	53,716	5,947	74,839
1895	21,664	60,522	11,001	93,187
1896	25,927	64,906	12,683	103,516
1897	24,468	41,440	10,211	76,119
1898	21,275	40,306	5,623	67,204
1899	29,376	60,369	7,810	97,555
1900	24,793	52,953	8,369	86,115
1901	21,323	48,538	8,760	78,621
1902	27,686	62,451	12,497	102,634
1903	28,005	39,345	9,359	76,709
1904	37,873	49,696	12,094	99,663
1905	30,378	72,872	13,712	116,962
1906	23,411	24,653	8,044	56,108
1907	41,863	27,008	12,738	81,609
1908	42,126	38,953	15,172	96,251
1909	39,261	42,781	14,497	96,539
1910	35,190	41,073	13,338	89,601
1911	60,902	56,824	5,140	122,866
1912	20,780	39,008	8,375	68,163
1913	33,995	38,583	9,699	82,277
1914				

the best grades are exported in unpressed bags, so as to run as little risk as possible of injuring the fibre by the pressure necessary for baling. The weight of the bales varies in different islands, from 250 to 500 pounds; but for statistical purposes the average is taken as 400 pounds.

Baling.

1. COTTON PICKERS. (NOTE THE SMALL QUANTITY IN EACH BAG.)
2. PICKING COTTON IN THE WEST INDIES.

SEA ISLAND COTTON.

II.—West Indian Crops, 1902—1913.

	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.
British* (in 400-lb. bales):												
Leeward Islands—												
Antigua	—	—	—	—	—	—	445	149	149	242	202	—
St. Kitts, Nevis, etc.	—	•	—	—	—	—	1,148	1,010	980	1,957	1,659	—
Montserrat	—	—	—	—	—	—	978	507	523	1,362	723	—
Virgin Islands ..	—	—	—	—	—	—	81	131	69	126	118	—
Total	—	148	290	982	1,401	2,335	2,652	1,797	1,721	3,687	2,702	3,060
Bahamas	3	16	21	17	33	21	33	30	15	33	33	34
St. Lucia	—	—	6	4	2	—	—	15	44	10	8	10
Jamaica	—	8	36	220	48	16	51	55	33	45	91	173
St. Vincent	135	108	315	345	658	1,070	1,052	872	1,305	1,345	1,130	1,212
Barbados	—	1	480	861	1,209	2,368	2,463	2,047	1,473	1,851	1,040	1,083
Grenada	619	753	786	532	778	725	584	809	664	686	951	1,002
Trinidad and Tobago ..	—	—	4	37	28	28	34	21	28	15	34	18
Total British ..	757	1,034	1,938	2,998	4,157	6,563	6,869	5,646	5,283	7,672	5,989	6,592
Equivalent in 500-lb. bales	606	827	1,551	2,399	3,326	5,251	5,495	4,517	4,226	6,138	4,791	5,274
Foreign† (in 500-lb. bales):												
Porto Rico (U.S.A.) ..	—	265	1,076	1,831	220	446	399	240	342	412	447	*400*
Cuba	—	77	61	21	1	—	—	—	—	—	—	—
St. Croix (Danish) ..	—	—	—	—	505	505	505	455	506	519	580	263
St. Martin (Dutch) ..	—	—	—	—	—	—	—	56	43	127	} *200*	*200*
St. Eustatius ,, ..	—	—	—	—	—	—	—	24	10	80		
Guadeloupe, Martinique } (French)..	1	1	13	7	14	7	49	21	11	8	8	8
Total	607	1,170	2,701	4,258	4,066	6,209	6,448	5,313	5,138	7,284	6,026	6,145

* From the Statistical Abstracts [Cd. 7,241] and [Cd. 7,786], and B.C.G.A. and Colonial Reports.

† Not including Hayti and San Domingo, whose crop (see Table A, III.) is not of Sea Island quality.

The by-products of the cotton seed are handled locally. The crushed seed is used for feeding stock, in some cases, apparently, without extraction of the oil; in others the oil is extracted and used for culinary purposes.

Seed and Oil.

The chief trouble among the West Indian cotton growers during recent years seems to have been the fear of over-production. While it is perfectly true that the demand for the very finest cotton is strictly limited, there certainly has not yet been any evidence of a serious glut in the market. The way in which the market has taken up large quantities of Sakel cotton, which, though not equal to the best, is of a high grade, has been rather a surprise to the trade. In view of the facts above stated with regard to the probable invasion of the American Sea Island district by boll weevil, it is most important that the area under the best Sea Island cotton in the West Indies should be maintained, so that, if the need comes, the West Indian supply may be rapidly increased to meet the deficiency of the American crop. At the best, however, it is doubtful whether the West Indies could supply a crop of the highest grades equal in amount to that at present obtained from the Carolina Islands, and the whole question of the future supply of the finest cotton is one of considerable anxiety. Egyptian Sakel can probably take the place of Florida and Georgia, but where is the supply of the best grades to come from if the Carolina Islands fail? In these circumstances it is most important that the development of the finer Egyptian cottons, and even of new types finer than anything yet produced there,

Demand.

should be pushed on, so that when the failure of the American Sea Island crop takes place, it will be possible to replace part of it at least with other growths from Egypt, as well as the West Indies. The question is also one of importance for the new fine cotton districts which are promising so well in Arizona and California.

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CHAPTER XVII

OCEANIA, ETC.

Philippine Islands—Dutch East Indies—Timor—New Guinea. Queensland—New Caledonia—Fiji—Tahiti—Hawaii.

To complete our survey of the world's cotton-producing countries we have still to mention a number of areas, mostly small, scattered over the whole of the Pacific Ocean, from Sumatra to Tahiti and Hawaii, and including Australia.

Philippines.

Cotton has never been cultivated in the Philippine Islands on a large scale, nor with proper systematic methods, but it has been grown to some extent as a catch crop. According to the U.S.A. Department of Agriculture statistics, the crop was 6,098 bales in 1902. Considerable quantities used to be raised for local consumption in several of the islands, but the importation of cheap cotton cloth and yarn from China and Japan reduced the production of cotton to an insignificant quantity. There seems to have been a general impression that cotton could not be raised commercially in the country, but a new series of experiments has recently been commenced with a view to testing this theory. No results, however, are yet available.

In the Dutch East Indies (Sumatra, Java, Borneo,

Celebes, and New Guinea) there is apparently a considerable amount of cotton grown,* chiefly in Palembang (Sumatra) and Demak (Java). The greatest difficulty apparently is the climate, which even in the dry season of the year is extremely humid. For this reason numerous efforts to introduce superior exotic varieties have failed, as these are apparently unable to stand the constant moisture so well as the native types. In Palembang it is said that the rivers often overflow their banks, and submerge the cotton-fields. In Demak cotton is apparently grown as a rotation crop after rice, and when the latter crop is late, the sowing of the cotton is delayed so long that the crop is not ripe when the rainy season comes again.

The native cotton is apparently of very short staple, fetching a price more like that of Indian than American. From 1906 experiments were tried in Palembang, with a view to improving the native cotton by hybridization, but these seem to have turned out badly. The Dutch National Cotton Association, with the assistance of the government, has been doing all it can to encourage the extension of cotton growing, especially by making advances to the growers, and ginning plant and baling presses were also sent out.

No recent figures are available as to the amount of the crop, but the figures of the exports are given in the table on p. 338.

In the island of Timor, which is partly Portuguese and partly Dutch, there is a certain amount of American cotton grown under the auspices of a company, with its headquarters at Hong Kong. Egyptian varieties were

* Also a little in British North Borneo.

also tried, but were not a success. No statistics are available.

The island of New Guinea was shared with the Dutch by Britain and Germany. In the German portion, essays in cotton growing produced as early as 1906 some very fine samples, described as of real Sea Island staple, which fetched a correspondingly high price. Notwithstanding this favourable beginning, it was doubted whether, in view of the irregular rainfall and the labour difficulty, any permanent success on a large scale could be looked for. Similar results have attended the trials made in British New Guinea in 1905, of which nothing more has been heard.

A small trial carried out at the German Imperial Station in the island of Bougainville (Bismarck Archipelago), with Caravonica cotton, gave an exceedingly fine staple of $1\frac{3}{4}$ inches in length, described as strong and of good colour.

Queensland.

The history of cotton growing in Queensland is interesting. It began with the American War, when, under the impetus of high prices, a considerable acreage was quickly put under cotton, and in 1871 the export was over 5,000 bales. The return of prices to the normal level after the war seems to have made it unprofitable to continue the crop; and the industry completely died out. Another attempt was made in 1890 to revive it, but this only lasted a few years. In 1911, 605 acres were under cotton, but the amount in the following year was rather less. In 1913, however, the Department of Agriculture took the matter up with the British Cotton Growing Association, and began a system

of distributing seed gratis, guaranteeing the growers a fixed minimum price of 1½d. per pound of seed cotton, with a further payment if the price actually realized was more than enough to cover the cost of ginning, baling, and shipping the cotton to Europe, and the original advance.

The cotton will be sold in England by the British Cotton Growing Association, which guarantees a minimum price of 6½d. per pound of lint for three years. The Association is also contributing £100 per annum for three years towards the cost of experiments for establishing a suitable variety of cotton.

There seems to be no doubt at all that there are large areas of land, both in Queensland and in the Northern Territory of South Australia, which are suitable for cotton growing, and many of the districts are provided with sufficient communications by rail to the coastal ports. Probably the labour difficulty will be the chief hindrance to the development of cotton growing on a large scale. The fixed minimum price does not leave much margin to cover a high labour cost, and unless an ample supply of native labour is available, the success of cotton as a white man's crop is rather doubtful Several varieties of cotton have been tried, including Sea Island, which seems to do well in the northern portion of Queensland, and Caravonica. In the district west of Brisbane, Upland seems to be the most suitable variety, but in Central and Southern Queensland long staple American varieties should do well. Nothing seems to have been done towards providing irrigation, which would make it possible to grow Egyptian cotton. Good yields—as high as 2,000 pounds of seed cotton per acre—are said to be

obtainable: but the heavy cost of the long journey to England is a severe handicap, especially on cotton of low value. At the time of the 1890 revival, a factory was started in the colony to manufacture local cotton, but it could not make headway, and was closed in 1897.

New Caledonia.

The French island of New Caledonia, lying due east of Queensland, possesses a tree cotton which was found growing wild, but which is said to have been brought originally from Peru by a colonist fifty years ago, and this and Caravonica have been the kinds most favoured there. A local association of planters works in co-operation with the French Colonial Cotton Association. There are two ginneries at Noumea, and large quantities of seed cotton are brought here to be ginned from the New Hebrides, which lie to the north.

As will be seen from the table on p. 338, the revival of cotton growing in New Caledonia dates only from 1908, when it first appeared in the list of exports with a total of only 1,100 pounds. Since then, however, progress has been very rapid, and in 1913 the crop amounted to 1,135 bales of 500 pounds. It is now a flourishing industry, and promises to assume important dimensions. The plant grows well even in the poorest soil, and in good soil, with proper cultivation, is said to give an average yield of 1,200 to 1,500 pounds of seed cotton per acre. Under the most favourable conditions the yield is said to be considerably higher. The quality also is reported as excellent; the local growers were receiving in 1912 nearly 2¼d. per pound of unginned cotton.

But what gave the greatest impetus to the industry was

the outbreak of a disease affecting coffee, the rival crop, and large areas formerly under coffee are now being turned over to cotton. It is therefore predicted that in a few years' time cotton will become the staple agricultural product of the country.

Fiji.

Cotton was at one time the second largest export of Fiji, and in 1880 the crop was valued at £30,000, but from this date cotton cultivation decreased owing to the competition of other apparently more profitable crops, particularly copra, sugar, and fruit, and from 1900 only very small quantities have been exported. Since 1906, however, experiments have been recommenced at the Lautoka experiment station. Several attempts have been made by the government to encourage cotton cultivation, particularly among the small Indian settlers, but until recently these efforts have not met with much success. Recently, however, the outlook has been more promising. The cotton grown is chiefly Sea Island of good quality, the high value of which enables it to bear the heavy transport charges to the European markets.

Society Islands.

In the French Society Islands, including Tahiti, a very considerable cotton crop was at one time produced. In 1865 and 1866 the Tahiti crop alone was valued at £100,000, but it seems to have steadily declined, till in 1903 it entirely ceased. Since then, however, attempts have been made to revive the industry, and apparently both Sea Island and Egyptian cotton have been tried with some success; but the lack of labour and the competition of other more profitable crops have seriously impaired the prospects of

COTTON GROWING IN THE EAST INDIES AND OCEANIA.

(For further details, see Table A, III.)

	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.
Philippine Islands ..	6,098	6,098	6,049	6,049	6,049	6,049	6,049	5,399	5,366	6,033	6,099	6,049
Dutch East Indies ..	6,634	12,341	13,970	13,188	13,507	14,305	25,046	23,812	24,701	22,967	23,801	30,000
New Guinea (German and British) ..	13	240	56	32	38	5	—	—	—	—	—	—
Queensland ..	1	1	17	75	52	73	78	86	101	125	100	*100*
New Caledonia (French) ..	—	—	—	—	—	—	9	17	58	202	839	1,135
Society Islands (French) ..	77	70	48	39	110	109	70	332	352	123	97	70
Fiji	—	—	—	—	—	6	7	—	4	—	—	—
Hawaii ..	—	—	—	—	—	—	—	—	—	—	250	*250*
Total ..	12,823	18,750	20,140	19,383	19,756	20,547	31,259	29,646	30,582	29,450	31,186	37,604

the crop, and as will be seen from the table on the opposite page, it has been going down in recent years.

Cotton growing in Hawaii seems to suffer badly from attacks of the pink boll-worm, besides weather vicissitudes, such as drought and high winds. It is claimed that if the boll-worm were eradicated, good Sea Island cotton could be raised in certain districts. Caravonica cotton has already given good results; a yield of 400 pounds of lint per acre was obtained experimentally, and in 1912-13, 300 acres produced a crop of 250 bales of 500 pounds. The staple is reported equal to the best rough Peruvian.

Hawaii.

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CHAPTER XVIII

THE USES OF COTTON

Complexity and specialization of the cotton trade—Chief districts — Division of processes — Spinning, weaving, and finishing—Classification of fabrics—Sewing-cotton—Volume of the cotton trade—Spindleage and consumption—Lace and hosiery.

As an outsider to the trade, moving alternately among the producers and the consumers, the writer has often been struck by the absence on either side of a working knowledge of the other, and he has taken upon himself, with much misgiving, the difficult duties of a go-between. While, therefore, this book has hitherto dealt only with the growing of the world's cotton crops, it seems desirable now to include a brief outline of the manufacturing side of the trade, so that the growers of cotton may have some idea of what happens when their finished product becomes raw material, of how cotton is spun and woven, and into what kinds of goods it is made. It is most important that the growers should have some idea of the requirements of the spinners and manufacturers. If, for example, the cotton grower who, by the use of mixed seed, or the careless handling of his crop, has produced a bale of mixed staple, could stand beside the spinner at the carding engine head, and see how much waste or

Growers and Spinners.

short staple cotton has to be taken out in order to secure that uniformity of staple which is essential to good yarn, he would perhaps understand why the cotton merchant to whom he sold that bale in his own town six months ago knocked two cents off his price because his cotton was mixed. The Egyptian fellah might get some notion of the supreme importance of fineness, evenness, and strength of staple if he could go into a Nottingham lace factory and watch the long series of mechanical processes through which the finest Egyptian or Sea Island yarns must pass in order to detect and remove every inch of "neppy" or thickened yarn, which would catch and break in the fine gauges of the lace machine.

In this chapter, therefore, an endeavour will be made to give some indication of the innumerable different uses to which cotton is nowadays put, and of the chief methods employed in its manufacture. To those, however, who have the least conception of the volume of the cotton industry, and of its extraordinary complexity, subdivision, and specialization, it will be obvious that nothing more can be given than the merest outline of the main processes or branches of the trade. In Lancashire, for example, each of these is centred in one district. Thus, the raw cotton is mainly handled in Liverpool, though Manchester has tried hard to establish such a market since the opening of the Ship Canal. Manchester handles the yarns and fabrics of all kinds; but of these only the yarns and "grey" cloth are dealt in on the Exchange, while the trade in all kinds of finished fabrics is done outside. The spinning, again, is divided roughly between Bolton, which spins only fine yarns, mainly

Localization.

Egyptian and Sea Island, and Oldham, which is almost entirely devoted to the coarser "counts" and American yarn. Weaving and finishing also have their own quarters, though the localization is not so marked in these cases; and when we come to the classification of fabrics, the complexity of the trade is simply bewildering. All that one can attempt, therefore, is a brief indication of the nature of the chief processes and a rough classification of the products.

The three main branches of the work are—(1) Spinning; (2) weaving; and (3) finishing. Where the yarn finds its ultimate use in the form of sewing-cotton, or hosiery or lace yarns for the Nottingham trade, the processes are merely spinning and finishing.

Spinning.

The spinning process includes many stages, which, however, may be roughly classified into—(1) Cleaning, or removing foreign matter, such as leaves and other "trash," from the fibre; (2) straightening the fibres so as to lay them parallel; (3) drawing out the cotton to the necessary fineness of the thread; and (4) the process of spinning proper, which consists in twisting the fibres together so as to make a continuous thread. It must be remembered that the possibility of making a continuous thread out of a large number of separate fibres of, say, an inch in length depends solely on the fact that the fibres have a natural curl or twist in themselves, and that by laying a number of them parallel to each other so as to overlap lengthwise, and then applying a twisting motion to the whole, the convolutions of each fibre are interlocked, as it were, with those of its

neighbours, so that the tensile strength of the resulting yarn depends, not on the strength of the individual fibre alone, but on the combined strength and mutual "grip" of the whole.

Strength of Yarn.

It will be seen, therefore, that the strength of cotton yarn depends on (1) the strength of the individual fibres, (2) the amount of overlapping of each individual fibre with its neighbours, and (3) the degree of tightness of the twisting which interlocks the curls of the individual fibres. The fineness of yarn, on the other hand, depends on the fineness of the individual fibre and the number of fibres. Obviously, the smaller the number of fibres in any given length of yarn the less will be the extent of overlapping of each fibre with its neighbours, unless each fibre is correspondingly longer. Thus fine yarns necessitate the use of long, fine, and strong fibres. But the prime necessity for the production of satisfactory yarn is uniformity in length of staple of the fibres used, for the presence of a number of short fibres at any point in the thread would mean that these would fail to engage sufficiently with their neighbours, and so leave a weak spot, which would break under the tension of the weaving process, if not in the mule during the process of spinning. Every effort must therefore be made to get rid of short fibres by "carding" or "combing" them out. At the same time inequalities in the yarn, due to the unequal character and strength of the individual fibre, must be minimized by repeated mixing or "doubling," which runs through the whole process of spinning from beginning to end.

Fineness.

Uniformity of Staple.

With this general explanation, the various processes may now be briefly described as follows: The cotton in the bale as it arrives at the mill is closely pressed and matted into a solid mass; and this must first be broken up in the "bale breaker," which pulls the cotton apart.

Cleaning.

Different bales of the same cotton, or even bales of entirely different cotton, are mixed together at this stage. The whole then passes to the "blower," which removes the heavier foreign substances from the cotton, such as have not already fallen out in the bale-breaker. The next process, known as "scutching," is mainly a further cleaning process; the cotton leaves this machine in the form of a "lap," a wide web or sheet of cotton of about an inch in thickness, with just enough consistency to allow of it being wound loosely on a roller. In this lap the fibres lie in all directions, and the object of the next process, "carding," is to

Carding.

separate them more completely, lay them parallel to each other, and remove all short fibre. From the carding machine the cotton comes out in a thin film of about the same width as the lap, but this is immediately condensed, by passing through a ring, into a "sliver," a round, soft, and untwisted rope of cotton of about an inch in thickness.

In the production of very fine yarns, the carding

Combing.

process is repeated in what is called "combing," a more careful process of removing all short staple.

The slivers, as they come from the carding or combing machine, then pass through three consecutive processes, known as "drawing," "slubbing," and "roving," the

object of which is to mix the different slivers so as to make them more uniform in thickness, and to make the fibres more perfectly parallel. At the same time the sliver is being steadily drawn out, and latterly it becomes necessary to twist it slightly in order to keep it together.

Drawing.

The final process of spinning consists of a further drawing out to the required length or fineness of the yarn, which is also twisted or "spun," to give it the necessary strength or cohesion. This may be done in different ways by two different types of machine, known as the "mule" (because it is a cross between Hargreave's spinning-jenny and Arkwright's roller-frame), and the more modern "ring" frame. In mule-spinning the processes of drawing, twisting, and winding are done separately. The "rovings" (or "slivers" as they come from the roving machine) are first passed through a series of small rollers set in pairs, each pair travelling at a higher speed than those preceding it, so that the thread is drawn to the one set of rollers faster than it can leave the previous set, and is thus drawn out still farther. As it leaves the last pair of rollers, it is carried to a small "cop," or bobbin, revolving on a spindle. These spindles are set on a movable carriage which is being drawn backwards, thus giving the yarn its final drawing to the necessary length. The carriage then stops, and the spindles rotate rapidly, thus twisting or spinning the portion of thread in the intervening space. Having done so, the carriage then runs back to the frame, winding up the spun yarn on the cops as it goes. This process is essentially the same as

Mule Spinning.

the original hand spinning—long before the days of the spinning-wheel—as still practised in the East. The cotton (or wool, as in the illustration at p. 276) is drawn out by the fingers of the right hand and the weight of the spindle, from the bundle held in the left hand; then the spindle is literally spun by the right hand, then raised to allow the spun yarn to wind on the spindle.

Hand Spinning.

In the ring frame the three processes of drawing, spinning, and winding are going on simultaneously and continuously, thus saving time, and greatly increasing the output of the machine per hour. In Lancashire the mule is preferred for fine yarns. Ring spinning is faster, and therefore cheaper, but does not give such a good result. According to the Census of Production, 1907, the average output of yarn per ring spindle was estimated at 60 pounds per annum as against 30 pounds per mule spindle.

Ring Spinning.

The preparation of the yarn for its final use depends upon whether it is to be used as sewing-cotton or as yarn for further manufacturing purposes. In either case certain of the following processes are employed. "Doubling" consists of combining two threads into one, and is done under water. Thus 2|120's means that two threads of 120 count have been twisted together, making the equivalent of a 60's thread. The object of this is to produce a stronger yarn than would be possible with a single yarn of the same final weight. "Twisting" is a process similar to doubling, except that the two threads are more tightly twisted together so as to give extra strength. "Gassing" consists of passing

Doubling.

the thread very rapidly through a flame, so as to singe off the loose nap from the yarn. The yarn is finally wound into an unlimited number of different forms according to the way in which it is to be used, *e.g.*, on "cops" to go into the weaver's shuttle, on warper's bobbins for "warping" (*i.e.*, winding on a "beam," the long roller upon which the vertical threads of a fabric are wound in the loom), or into hanks, bundles, or "cheeses."

Gassing.

In addition to these, if the yarn is not to be used "in the grey," that is to say, in its natural condition and colour, it may pass through further processes of finishing or preparation for its final use, including bleaching, dyeing, mercerizing, and various other "faking" processes, *e.g.*, "preparing" for use as silk.

Yarn Finishing.

The most important of these finishing processes is "mercerizing." The hank of yarn is extended on a simple frame, and dipped into a warm solution of caustic soda. The natural tendency to shrink is prevented by the yarn being held on the frame, which is therefore equivalent to a slight stretching of the yarn. The result is marvellous; it gives the yarn a brilliant lustre, almost like silk.

Mercerizing.

The variety of woven fabrics is endless, but a rough classification, according to the method of weaving, may be attempted as follows:

A fabric may be either "plain" woven or "fancy" woven. In the former case the warp, or vertical, and weft, or transverse, threads of the cloth are both homogeneous, but not necessarily the same, *e.g.*, it may be

Egyptian warp and American weft. In fancy weaving, either warp or weft may vary infinitely in respect of (1) the substance of the yarns used, *e.g.*, cotton or wool and silk may be used in alternate threads or stripes; (2) the quality of the yarn, *e.g.*, American or Egyptian; (3) the count of the yarn; (4) its finish, *e.g.*, whether plain or mercerized; and lastly (5) colour, whether grey, bleached, or dyed. The unlimited variety of pattern which may be introduced by Jacquard loom weaving makes detailed classification of these fabrics impossible, especially as they are mostly for a season's trade and vary every year.

Fabrics. Fancy Woven.

Finishing of piece goods, again, gives room for the introduction of infinite variety. The plain woven grey cloth may be either bleached, dyed, mercerized, "schreinered," or printed. The process of piece mercerizing is essentially the same as that of yarn mercerizing already described. Schreinering is a further process of finishing, under which the hot rollers, between which the cloth is passed in the process of "calendering" or ironing, are engraved with very fine diagonal lines. These cut the surface of the thread in the fabric, thus giving increased light surface, and producing a wonderful effect like satin. A piece of fine Egyptian cloth which has been mercerized and schreinered might well deceive any ordinary buyer into believing it to be silk or satin.

Finishing of Fabrics.

Fancy woven goods may also be subjected to any of these processes of finishing, besides a number of processes which are more or less of the nature of "faking."

In conclusion, a few figures may be taken from the Report of the First Census of Production of the United Kingdom (1907) as an indication of the volume of the cotton trade in Great Britain. The most convenient figure from which to obtain an idea of the total bulk of the trade is that of the quantity of yarn produced, for nearly all cotton manufactures must pass through this stage. It is estimated that the total make of single yarn in the year of the census was about 1,800 million pounds, with a selling value of about £90,000,000, or an average of 1s. per pound.

Volume of the Industry.

This 1,800 million pounds of yarn represents the finished product of, say, 4,000,000 bales of cotton of all kinds consumed in Great Britain, according to the International Federation statistics, taking the average of the seasons 1906-07 and 1907-08. As a very rough guess, the value of this cotton may be taken at the average price of American middling for these two seasons, which was 6·27d. per pound. Thus it took, on an average, 1·1 pounds of cotton to make 1 pound of yarn, and the average cost of the raw material per pound of yarn was nearly 7d. or 60 per cent. of the average value of the yarn.

Cost of Raw Material.

Of the total yarns produced, 241 million pounds, or 13·4 per cent., were exported, the remaining 1,559 million pounds being sold in Great Britain to manufacturers, either of cloth and thread (sewing cotton) or of lace, hosiery, elastic webbing, ropes, etc., or to be mixed with other fibres.

Exports.

Of the total product, only about 10 per cent., or 190 million pounds, of cotton yarns were handled by

bleachers, dyers, etc., at a cost of £1,658,000, or an average of 2d. per pound. This means that the great bulk of the yarn is woven in its natural state into grey cloth. Thus, of a total of 7,088 million yards of piece goods of all kinds, 6,390 million yards, or 90 per cent., were unbleached or grey cloth. The value of the total output of piece goods was estimated at £82,324,000, or an average price of nearly 2·8d. per yard, which, however, represents only the factory value of the goods, not their final value as ready for export or consumption. The quantity of piece goods subsequently bleached, dyed, printed, or finished, was given as 4,661 million yards, or 66 per cent. of the total, and the amount paid for the work done, £12,132,000, or 0·6d. per yard. Of the total piece goods produced, 6,298 million yards, or 89 per cent., were exported.

Grey and Finished.

Miscellaneous cotton manufactures, such as machinery belting, tape, and other small wares (but not lace and hosiery), account for £9,665,000 worth of products. About 320,000,000 lbs. of waste were produced by cotton spinners and weavers, but it is impossible to say how much of this was respun, and how much used for packing, medical purposes, gun-cotton, blotting-paper, or as waste by engineers, etc.

Miscellaneous Uses.

The cotton trade (excluding subsidiary trades, such as bleaching, dyeing, machine-making, etc.) gave employment in the year of the census to 572,062 people, including both wage-earners and salaried persons; of this total 352,082 were women and girls.

Employees.

To give some impression of the relative importance of

the cotton trade to the other textile industries in Great Britain, it may be mentioned that out of the total value of the gross output of all these trades, £333,561,000, rather more than one-half, or £174,601,000, was credited to the cotton trade, while wool, the next largest, accounted for only £75,905,000. The lace and hosiery trades amounted to £19,789,000, of which lace was responsible for a little more than half. These trades, of course, employ silk, wool, and other materials, as well as cotton; but the latter represents nearly 90 per cent. of the whole raw materials of the lace trade.

Other Textiles.

The actual output of finished goods by the hosiery trade, including hosiery proper, knitted garments, both for outward and underwear, and gloves, was valued at £8,638,000; the total quantity of hose made was altogether 14,409,000 dozen pairs. Of the total hosiery output, it is roughly estimated that 55 per cent. in value is all wool, 20 per cent. made of cotton, and about 25 per cent. of mixed yarns.

Hosiery.

The best impression of the relative position of Great Britain in the world's cotton manufactures is obtained from the International Federation's statistics of spindleage and consumption of cotton, given in Tables B, III., and B, IV., in the Appendix. From these it will be seen that in spite of the rapid development of the cotton industry throughout the world, Great Britain in 1912-13 still owned 55,652,820 spindles out of the world's total of 143,452,659, or 39 per cent. of the whole. Five years earlier, with nearly 3,000,000 fewer spindles, her share was 41 per cent. of the total.

Britain's Share.

Her proportion of the total world's mill consumption, as calculated from the Federation statistics, was barely 19 per cent. in 1912-13, as against 21 per cent. in 1907-08.

An interesting point with regard to the relatively low figure of Great Britain's consumption arises out of the figures of consumption per 1,000 spindles in each country. It will be seen that in 1912-13 Great Britain's average was only 77 bales per 1,000 spindles, as against 152 in Germany, 272 in Russia, and 691 in Japan. This points to the fact that the value of any nation's cotton trade is not to be measured by the quantity of the raw material consumed. On the contrary, Great Britain's very low average simply indicates the general tendency towards finer goods, which has been the most marked feature of the development of our trade for a good many years back. It will be noticed that only Switzerland excels us in this respect, with an average consumption of 70 bales per 1,000 spindles; but this, again, is not to be taken quite at its face value, on account of the statistical confusion introduced by the different bale weights in different countries. The Federation statistics are compiled in actual bales, and of Switzerland's consumption nearly 30 per cent. is Egyptian cotton, as against only 9 per cent. in England. As the Egyptian bale averages about 730 pounds net, against about 490 pounds net for American, it will be seen that Switzerland's consumption is really higher than it looks, and in fact it probably averages about the same as our own. A similar argument applies to the very high figures in Russia and Japan. These are largely due to the fact that the current

Consumption per 1,000 Spindles.

bale of Russian cotton is much less than 500 pounds. In Japan, where the consumption consists largely of Indian cotton, and probably also Chinese and Korean, the same thing holds good, but their extraordinary consumption (717 bales for 1,000 spindles in 1911) is due to two other facts, namely, that their mills use ring spindles entirely, and that they work night and day.

But the prime importance of the statistics of consumption is to bring out the general relation between the world's consumption and production of cotton as a whole. In comparing the statistics given in Tables A, I., and B, I., of the Appendix, however, the greatest care must be taken not to dogmatize on the apparent results. There is so much margin of error in all the statistics which go to make up the totals in both cases that no definite conclusions are permissible. Again, the difficulty of the various bale weights might easily vitiate any detailed argument founded on the apparent totals given in the tables. But making all due allowance for these considerations, which are more fully discussed in the note on Table B, II., in the Appendix, the statistics do seem to bear out the general statement with which the writer began in the introductory chapter, that the world's consumption of cotton has been more than keeping pace with the production, that there has been in many years an actual excess of consumption over production, and that, generally speaking, the statistical margin between the two is far too small for comfort.

Supply and Demand.

CHAPTER XIX

THE USES OF COTTON SEED

A modern trade—Processes of manufacture: Delinting and decortication: Pressing and refining: By-products—American, Egyptian, and Bombay crops: Different methods—The markets for oil and cake: Edible oils *v.* soap fats: Animal fats *v.* vegetable oils: Competitive Feeding-stuffs—Recent changes in relative values—New processes.

THE development of the cotton-seed trade, and the extraordinary variety of uses to which it is now put, is one of the romances of modern industry. Twenty years ago the seed was regarded almost as a nuisance which cost money to get rid of, unless it could be used as manure, or sometimes as fuel. Ten years ago it was one of the stock illustrations of the utilization of by-products; now it is an industry in itself, with a turnover worth probably £50,000,000 per annum, and its finished products are the raw material of a hundred trades, from cattle-rearing to soap-making.

The general outline of the processes of manufacture must first be described. Its nature depends, in the first place, on the character of the seed. American Upland and Indian seed are what are known as "white" or "fuzzy" seeds, owing to the short lint or fuzz with which the whole seed is coated, and which is not removed by

the process of ginning. Egyptian and Sea Island seeds, on the other hand, are "black" or "clean" seeds, having no short lint or fuzz, except occasionally a small tuft of short green lint on the pointed end of the seed. In America, therefore, it has always been customary to put the seed through what practically amounts to a second ginning process called "delinting," and the short lint thus obtained is what is known as "linters." These are of comparatively small commercial value, being fit only for such purposes as gun-cotton or blotting-paper, but they constitute quite a considerable proportion of the American crop—631,000 bales, or over 4 per cent. of the whole crop in 1913. A similar process has, in recent years, been applied to Indian cotton seed, or Bombay seed, as it is generally called in European markets. Even after delinting, however, the greater part of the short fuzz still remains on the seed.

Delinting.

The next process in the case of American seed is decortication, which consists practically of cutting or cracking the seed, so as to separate the kernel from the husk, with the fuzz which still adheres to it. In Egypt and in Europe the whole seed is crushed without separating husk and kernel, and Bombay seed is treated in the same way as Egyptian. In China, where cotton-seed crushing began only a few years ago, the American methods are followed.

Decortication.

The meal or crushed kernel, or the whole seed crushed, as the case may be, is then heated by steam in an enormous kettle, after which it is put into bags, or wrapped in cloths in an oblong shape; it is then pressed in

hydraulic presses of great power, thus extracting the oil and at the same time giving to the remainder the peculiar form in which it is so well known as cake for cattle-feeding purposes.

Pressing.

The crude oil from the presses is refined by various processes, chiefly based on the use of caustic soda; and is used either as edible oil or for soap-making according to its quality. In the case of Egyptian oils made from undecorticated seed, a small quantity of dark resinous matter exudes from the husk in the crushing process, which darkens the colour of the oil and gives it a peculiar flavour. To remedy this, it is necessary to use stronger chemicals in refining the oil; but until the recent discovery of a new process it was never possible to entirely eliminate the peculiar flavour, and this seriously handicapped the use of these oils for edible purposes.

Oil Refining.

The black grease or refuse of the oil-refining process goes through various further processes, by which still other by-products, such as glycerine and white candle-grease, are taken from it. The residue is at last reduced to the consistency of pitch, and in this form it is spread upon brown paper with a thin layer of coarse cotton fibre on its surface, thus forming the familiar waterproofed wrapping paper in which many forms of textile and other goods are packed, especially for export.

By-products.

In view of the predominance of the American crop in the world's cotton supply, American cotton seed naturally supplies the bulk of the cotton-seed oil trade. It is chiefly manufactured in the United States, and is

largely consumed in that country, as well as being exported to all parts of the world. A considerable quantity of cotton-seed meal is also exported, but the cake is mostly consumed in the United States. The Egyptian crop is partly crushed in Egypt, though the greater proportion of it is exported in the form of seed to European ports. Most of the Bombay crop is also exported, chiefly to the United Kingdom. France and Germany take a considerable share of the Egyptian crop, but about half of it still goes to Great Britain, though Germany, on account of recent tariff changes, is taking an increasing amount of the Egyptian and Asia Minor seed.

American Trade.

Egyptian and Indian.

The distribution of the finished products of the industry in Egypt is interesting. Of the cake, by far the greater part—as much as 99 per cent.—goes to England, very little being used in Egypt. Of the oil, probably 80 per cent. is used in Egypt as edible oil, or is exported to Turkish possessions, where it enjoyed the protection of the customs duty levied on similar products coming from other countries. Comparatively little oil is sent to Europe, but there used to be a small export of the finest qualities to France for use there as edible oil. The soap is also used chiefly in Egypt and neighbouring parts of the Turkish Empire.

England.

The English cotton-seed industry is centred in Hull, Liverpool, and London, with a considerable trade also in Glasgow, Leith, and Bristol. As already mentioned, it is confined practically to Egyptian and Bombay seed, Egyptian being more than

half of the total, though the proportion has been greatly reduced in recent years; but its finished products must, of course, face the competition of those of the American industry.

Relative Values.

In discussing the relative value of different oil seeds, it is necessary to keep in view the two main products of the seed—namely, oil and cake. Thus, as regards the quality of the oil produced, the American method is superior for the production of high-class oils; the removal of the husk or shell by decortication, and the use of the crushed kernels alone for the production of oil, seems to produce a finer quality of oil than can be obtained by crushing the whole seed. Thus, the standard grade of American sweet oil, known as "Prime Summer Yellow," used to represent the highest quality among the world's cotton-seed oils, while the Egyptian came next, and Bombay last.

Edible Oils.

The market for cotton-seed oil is highly complex or composite, alike from the side of supply and of demand. Cotton-seed oil enters into two distinct markets, which may be generalized as edible oils and soap fats; and in each of these fields it has competitors innumerable. Thus, as edible oil, it has to find its place in a long list containing all the animal fats, lard, and even butter itself, as well as all the other edible vegetable oils, especially olive oil. In this branch of the market American cotton-seed oil, until a few years ago, stood quite alone. Egyptian oil, owing to the peculiar flavour above referred to, was so far behind the American as to be hardly a competitor at all, while Bombay cotton-seed oil was not regarded as possible for

edible purposes. Bombay oil, along with a number of other vegetable oils, such as those obtained from linseed, maize, soya beans, rubber seed, copra, cocoanut, palm oil, sunflower, and many others, the very names of which are hardly known to the average layman, had their places at various points in the supply of vegetable oils; they were mainly used in the soap and candle trades and other manufactures, where also, until recently, Egyptian cotton-seed oil found its chief demand. In this trade the vegetable oils have to compete with tallow, whale oil, and other low-grade animal fats, the better qualities of which come into the more profitable market for edible products. Mineral oils, such as petroleum, are, of course, an entirely separate branch of the oil trade.

Soap Fats.

Conditions, however, have changed very materially during the last few years in all the trades into which cotton-seed oil enters, and the relative position of the different products has been entirely changed. It is impossible to enter into these changes here in detail, but on the whole they have been in the direction of improved methods of dealing with what were formerly the lower grade oils from the edible point of view, such as Egyptian and Bombay. In 1910, owing to the failure of the usual supply of edible oils and fats, such as olive oil, American cotton seed, and American hog lard, a great deal of attention was devoted to discovering improved methods of handling these crops, especially the Egyptian, so as to improve the quality of the product from the edible point of view. It must be remembered that the chief use of oil for culinary purposes

Recent Developments.

in England is not as oil—butter, the most expensive form of animal fat, has always taken in England the place filled by oil in Europe—but in some composite or made-up form, such as lard, margarine, etc. Until 1910 the makers of these goods preferred either animal fats or the finer American sweet oil. But in 1909 there was an extraordinary combination of disastrous shortages in almost every branch of the supply of edible oils and fats, with the result that the consumers were forced to turn their attention to other sources of supply, and particularly to Egyptian oil. The result was a marked change in the position of Egyptian cotton-seed oil in the English market.

Rise of Egyptian.

It was no longer merely a soap fat, but also an edible oil (as it always had been in Egypt), and therefore able to command a higher price, which was still further augmented by the general high level of prices of all edible oils. In the following year, however, the enormous American crop entirely reversed the conditions, and the value of Egyptian oil returned to something like its former relative position, while the lower price of American oil again made it available for soap-making.

Bombay Oil.

In the same way, but to a more marked degree, Bombay oil had always been looked upon in England as quite impossible for edible purposes; but in modern industry it is not safe to say that anything is impossible, and of late years certain makers have succeeded in producing quite satisfactory edible oils from Bombay seed.

Many other oils have passed through a similar phase. Thus, copra and palm-kernel oil were found adaptable

(under pressure of unusual demand) for certain edible purposes, especially margarine; and even soya-bean oil, which at first was classed as only fit for soap-making, soon proved an excellent substitute for linseed oil, and was then, by still further refining, made into good salad oil.

Other Oils.

Again, a new process of deodorizing oils has produced almost a revolution in the supply both of soap fats and edible oils. This process, first introduced in America about eight or ten years ago, consists in blowing superheated steam through the oil, thus removing all objectionable flavours, and making it possible to extend enormously the possible sources of supply of edible oil.

Deodorizing.

The new hardening process is still more of a revolution. The original patent is about twelve years old, but it is only recently that it has become possible to apply the new method commercially. Broadly, the whole group of oils or fats may be divided into two sections: soft or liquid oils, and hard or solid oils. Linseed, cotton, rape, whale, etc., belong to the first group; cocoanut and palm oil, etc., to the second group. There has until recently been a difference of nearly £10 per ton between the soft oils and the hard oils in favour of the latter, owing to the fact that a certain proportion of hard oil had to be used in the manufacture of margarine and soap in order to produce a firm product. The new invention was based on the discovery that by the removal of certain constituents soft oils could be converted into a hard stearine. Thus, linseed oil, whale oil, and cotton-seed oil, when treated by this new process,

Hardening.

became harder and more solid than even tallow. The cost of the process is about £3 per ton. At first there was, of course, a big profit for the manufacturers who had plant for this process; but in the course of time, when a sufficiently large quantity is being handled, the result on the oil markets of the world will be to draw the two groups closer together in value, because of the readiness with which the one can now be substituted for the other. The effect of such a revolution as this is not to increase the available quantity of fats and oils for the world's consumption, but rather to change the course of markets from one industry to another. As far as cotton-seed oil is concerned, the net result will probably be that the whole output will now be available for edible purposes in the form of hard fat, but a further supply of that or some other material will be required to meet the requirements of the soap trade. On the other hand, the lower grade of cotton oil from damaged seed, which cannot be made edible, will have a higher value for the soap-maker in future, because, when hardened, he can use such oils alone, without being forced to introduce the same proportion as hitherto of tallow, cocoanut oil, or other hard fat.

Oilcake.

As regards the cake or meal, the relative value of the products of the various crops depends on very different conditions from those which affect the oil. For cattle-feeding purposes they come into competition with an entirely different set of products, which constitute the supply of feeding-stuffs. These include not only all the other seed cakes, such as linseed, sesame, sunflower, groundnut, etc., but also the natural feeding-stuffs, such as corn, maize, grass, hay, turnips,

clover, and, on the Continent, beetroot. The comparative values of the different cakes depend on their suitability for feeding purposes, which varies greatly.

Different Uses.

Thus, American seed-meal, again owing to the removal of the husk by decortication, has a peculiarly laxative effect on cattle, which classes it along with linseed cake, and as a rule prevents its being used alone. The Egyptian cake, on the other hand, possesses certain astringent properties, due to the leaving of the shell in the meal when crushing, which are desirable in certain cases, but restrict its use in others. Bombay cake, again, until a few years ago, had the reputation of being severely astringent, the popular belief among farmers being that, as Bombay seed is white or fuzzy, and the short lint was not taken off before crushing, there was a considerable amount of hair in the cake, which was dangerous to cattle if used alone. On the other hand, by using Bombay along with linseed or turnips, which possess a similar laxative quality, good results could be obtained, for again, while linseed cake was regarded as the best for feeding cattle for the butcher, Egyptian was looked upon as better than Bombay for dairy cattle. All this was, of course, largely a matter of common belief, which in many cases was synonymous with prejudice, and was exceedingly difficult to counteract.

It must be remembered that the different values of these cakes depend not so much on any peculiarity of the seed from the various countries as on the method of manufacture. Thus, American cake, because it is decorticated and contains nothing but the crushed kernels, is much richer than the Egyptian cake, which consists

partly of husk, having practically no feeding value. In the same way the Bombay cake contains a still heavier proportion of what may be called non-nutritive matter, namely, husk and hair, so that its nutritive or feeding value is lowest of the three. The reason why these different methods are adopted is largely circumstantial. American seed is decorticated because it would not be profitable to pay export freight on the extra weight of hull and hair. Indian is not decorticated in Europe because it is intended for home consumption, and its extra weight of cake per ton of seed makes it possible to sell it much cheaper. Though less nutritive, it is perfectly suitable for *feeding* cattle (it is specially used for sheep) as opposed to *fattening* for the butcher. For that purpose linseed cake is specially used, while decorticated cotton cake, and such others as groundnut cake, sesame, and soya cake, are used more especially for dairy purposes; the richness in albuminoids and the high state of concentration help the yield of milk without putting fat on the animal.

Recent Changes.

In the market for cattle-feeding stuffs fluctuations have been equally violent. In 1910, for example, the abnormally high price of Egyptian cotton seed, due to the demand for the oil, raised the price of Egyptian cake to such an extent that the manufacturers were compelled to turn their attention to the improvement of the Bombay cake, and they did so with considerable success. The farmers were compelled by the high price of Egyptian cake to consider the cheaper alternative, and found that under the improved conditions of manufacture, and by adopting special methods of using it, they could get very satisfactory

results. Soya cake, too, has made an important position for itself in the market for feeding-stuffs. Being rather like linseed in its laxative properties, it has proved a very useful ally to Bombay cake, and for a time the joint use of these two seemed to take the place of Egyptian cake.

Conclusion.

This very brief outline of the cotton-seed industry, with all its ramifications, may serve to bring out again, by way of conclusion, the world-wide character of the conditions which affect the supply of and the demand for the products of the cotton plant. It is no exaggeration to say that to know much about the world's cotton crops one would require to know something of every country in the world, for if there be a country which neither grows cotton nor any other material which comes into competition with it, there is certainly no race in the world which does not either wear cotton clothes, use soap or candles made from cotton-seed oil, or consume it in some of its many edible forms. There is nothing that can happen in the world, from a revolution in China to a bad monsoon in India, the opening up of a new world's route by the construction of a canal across an isthmus, or the building of a railway across a continent, which is not certain to affect cotton in many ways. It is a fascinating study, and a subject of the most direct economic importance to many millions of the world's inhabitants. Of no industry is it more true that the one half of the world does not know how the other half lives. The writer will be well content if, by this very hasty survey of such an enormous field, he has succeeded in rousing among individuals here and there in different parts of the trade a little curiosity about the rest of their world.

CHAPTER XX

THE EFFECTS OF THE WAR

State of trade when war declared—The 1913 crops and estimates for 1914—Financial crisis: Closing of the Exchanges: Suspension of shipping: Short time—Remedies: Government Marine Insurance: Financial and currency measures—Situation in America, India, and Egypt—Future prospects: Redistribution of the trade: German colonies—The British Empire and cotton growing.

THE effects of the war upon the cotton trade are so varied and complex that it would require a whole volume to deal with them; it is impossible here to do more than indicate their probable effect on the writer's main thesis as to the relation between the world's cotton supply and the demand for it. To make that clear, it is first of all necessary to explain briefly the history of the chief crops of 1913-14, and the general position of the world's cotton markets at the outbreak of the war.

Taking first the American crop, the area under cotton in 1913 was first estimated at 35,622,000 acres; but this figure was subsequently raised to 37,458,000, being the largest area ever recorded.* From such an area a record

* The figure of 37,089,000 acres given in the table on p. 100 is arrived at by deducting 369,000 acres abandoned after sowing. The figures are those of the Department of Agriculture's Bureau of Crop Estimates (formerly the Bureau of Statistics).

crop might have been expected; but a severe drought in the Western States caused serious alarm in August and September, and ran the price up to its maximum figure for the season (7·96d.). Later on, however, it turned out that the Eastern and Central States, having escaped the drought, had produced crops sufficiently large to counterbalance to some extent the shortage in the west, and the final yield of the crop was 14,609,968 bales, being the second largest on record. On such a large acreage, however, this gives only a poor average yield, namely, 0·39 bale per acre. The average price for the season was high (7·26d.), and would have been higher but for the fall of prices due to the war during the last six weeks.*

American Crop, 1913.

The acreage in India (24,595,000 acres, according to the government estimate) was also a record, and the official estimate of the crop (5,201,000 bales) has only once been exceeded—namely, in 1909. The commercial estimate of the crop, however, was still higher—namely, 6,000,000 bales. The result was that the price during the following season showed a tendency to sag below that of American, and the discount on the season's average price was much greater than the average of the last twenty-five years.

Indian.

The Egyptian crop and acreage also touched record figures (7,684,172 kantars from 1,723,094 feddans), and the average yield of 4·46 kantars per feddan was a distinct improvement on recent years. The result was that

* It may be mentioned here that the cotton season is to run in future from August 1 to July 31—*i.e.*, a month earlier than formerly—and all statistical compilations will be made accordingly.

the premium of Egyptian over American averaged only 30 per cent. for the season, as against 46 per cent. in the previous year, and 57 per cent. in 1911-12. It was, in fact, the lowest since 1903-04, the year of Sully's corner. During June, 1914, it actually dropped below 20 per cent. for a time, and the unsold stock in Alexandria at the end of the season was 766,300 kantars, a figure never before approached.

Egyptian.

With regard to the estimated crops for the year 1914, the first estimate of the American acreage was 36,900,000, being a considerable increase on the preliminary estimate for 1913, though well below the final figure for that year; but the final estimate for 1914 showed a slight decrease on the preliminary figure (to 36,722,000 acres), so that the acreage for 1914 was evidently distinctly less than in 1913. The season began badly with very heavy rainfall during the sowing season, and at first the prospects of the crop were fairly black; but during the summer months the weather was so exceptionally favourable that the appearance of affairs changed completely, and even before the war broke out it was evident that the crop was going to be large. This was fully confirmed by the early ginning figures, and by November it was almost certain that the crop was again going to mark a new record. The government estimate, published on December 10, was 15,966,000 bales of 500 pounds, exclusive of linters, as against 14,116,000 bales in the previous year, and 15,693,000 in 1911. This was generally accepted as indicating a commercial crop of at least 16,500,000.

Estimates, 1914.

American.

With regard to the Indian crop, the government's December estimate put the acreage at 24,030,000, being almost the same as that of the previous year, but the crop, so far as could then be judged, was likely to be lower, as all the provinces reported lower yields per acre.

Indian.

As to the Egyptian crop, the season of 1914 is likely to prove even more unsatisfactory than its recent predecessors, which have developed a consistent tendency towards high early estimates and disappointing final results, though to this, by the way, the crop of 1913 was a marked exception. The acreage for 1914 was estimated at 1,755,720 feddans, being nearly 2 per cent. more than the previous year, and until the end of September the crop promised exceedingly well. About October, however, the reports suddenly became very pessimistic. Serious damage by pink boll-worm was spoken of, and the government's first estimate in November placed the crop at 6,850,000 kantars as a maximum. The estimate of the Alexandria General Produce Association, dated December 4, was still lower, being only 6,000,000 to 6,500,000 kantars.

Egyptian.

To complete this brief account of the situation at the outbreak of the war two other points must be mentioned. The first is that the agitation in America for legislation against futures at last resulted in the passing of the Lever Bill through both Houses of the Legislature on August 18, 1914, and the Act in its final form was more drastic than even the original proposals. The tax on futures, originally one-tenth of a cent per pound, was raised first to one cent, and finally,

Futures Legislation.

in the Joint Committee, to two cents per pound. Before the Bill was passed, however, the war was upon us, and the possible effect of the Act had been entirely discounted by the greater dislocation produced by the war.

Short Time.

The other event of the season was the English Federation's organized short-time movement, which was carried to a successful issue in July, and provided for a stoppage of 166½ hours between July 7 and September 30. This only applied, however, to the American section of the trade. The reason given for the adoption of this measure was that the price of the raw material had gone to such a high level that spinners could not get a sufficient margin on the price of their yarns. The trade seemed at last to have reached the point of rebelling against the high level of yarn prices, and the spinners were being crushed between the upper and nether millstones of high cost of raw material and low selling prices. Thus, even before the outbreak of the war, the cotton trade was not in a specially healthy condition; prices of raw material had gone too high, and trade, in the American section at least, was distinctly depressed. Before the probability of a record American crop was sufficiently realized to alter these conditions, the catastrophe of war had entirely changed the situation.

Austria declared war against Servia on Tuesday, July 28, 1914. Within three days the cotton trade throughout the world, in common with all other trades, except those dealing in food supplies and war materials, was in a state of collapse. The first thing that brought the trouble home to those not directly interested in the trade was the sudden

closing, on Friday, July 31, of the Cotton Exchanges, particularly Liverpool, New Orleans, and New York, as well as many of the other Produce Exchanges and all the Stock Exchanges throughout the world. The striking point to be noted here is that this was before the actual declaration of war between any of the Great Powers, and particularly before it was at all certain that Great Britain was to be involved in the war. It was not, therefore, a question of our trade being affected by our own circumstances, but of its being upset by external circumstances, which at first had nothing to do with us. The closing of the Stock and Produce Exchanges was simply part of the terrific financial crisis which spread all over the world in that memorable last week of July. The world's financial system is a huge and highly complicated organization, of which London is the centre, and upon it all our trade, both home and foreign, depends. In three days this world-wide system was brought to a dead stop by the failure of one section of the machinery—namely, the system of foreign exchanges, by which foreigners remit to London in payment of their debts; and as the Lancashire cotton industry is very largely dependent on foreign business, the effect of this stoppage was immediately felt by the trade.

Exchanges Closed.

Financial Crisis.

It is impossible to describe here the ramifications or the methods of operation of the London Money Market with its world-wide connections, centred in Lombard Street. The world's money markets with all their complicated credit arrangements, and the causes and effects of international gold movements, are perhaps the most

wonderful, and certainly not the least technical organization in the world of modern business. It is sufficient here to state without fuller explanation that the immediate cause of the breakdown of the foreign exchanges was the unanimous decision of the Continental State Banks to stop the withdrawal of gold from their reserves in view of the possibility of a European war. The immediate effect was that it became impossible to buy exchange (bills or drafts) on London, and our foreign debtors being thus prevented from meeting their obligations to us, we suddenly found ourselves unable to pay our own creditors, either home or foreign. As all modern industry, including both home and foreign trade, is based upon credit, this meant the complete breakdown of the whole system, and the cotton trade simply went with the rest.

Foreign Exchanges.

There was, as it happened, a further special difficulty in the cotton trade, in the fact that there was at the time a very large "straddle" account open between New York and Liverpool—that is to say, a very heavy speculative account on the difference in price for the time being between the two exchanges. The heavy fall in prices which preceded the closing of the exchanges, and became still more marked immediately afterwards, practically meant bankruptcy to all parties concerned if the exchanges had remained open.

Speculative Position.

The general effect of the war upon our banking and currency system must be left for description elsewhere. Steps were at once taken to meet the unprecedented conditions, and when the declaration of war between England and Germany actually took place on Tuesday,

August 4, the first shock of the crisis had already passed. But the definite announcement of a state of war brought other consequences for those directly engaged in foreign trade, especially the cotton trade. The mere possibility of war had already raised the cost of marine insurance to a prohibitive level—in fact, the underwriters had practically refused to do further business at any price. During the first week of August, therefore, shipping practically came to a standstill, and for a time our export trade ceased.

Banking and Currency.

War Risks.

The effects on the cotton trade of this financial and industrial cataclysm worked themselves out in various ways. The first was the almost universal stoppage of delivery orders under existing contracts, for with the fall of prices, limited only by the fact that there were no exchanges open to record prices, it was almost impossible for anyone in the trade to undertake business ahead. Again, those manufacturers who were working for foreign trade found it impossible to ship the goods when they were made. On the top of this came the difficulty of getting the raw material, for most of the mills carried only a relatively small stock, and owing to the closing of the exchanges the ordinary methods of purchase were no longer available. Very soon short time became more or less general throughout the trade, and many mills were closed down altogether.

Effect on the Mills.

Our concern here is necessarily limited to the effect of these conditions on the value of the raw material and its ultimate effect on the future course of supply; but

even from that point of view it is necessary to indicate the measures adopted to deal with the crisis. Obviously, the first point that had to be dealt with was the re-establishment of our shipping trade, to make it physically possible to get goods away. That, of course, was first of all a matter for the navy, and it soon became evident that in that respect our position was likely to be as satisfactory as possible. But before matters had settled down sufficiently to enable the underwriters to measure the risks and establish a new scale of premiums, it became evident that nothing but the bold tackling of the question by the government would meet the case; and when the history of this war comes to be written, one of the most satisfactory features of these early weeks will be the way in which the government rose to its responsibilities. The whole business of marine insurance against war risks was taken over by the state, the government undertaking to cover any venture to the extent of 80 per cent., at a fixed premium, leaving the balance to be carried by the owner. The rate of premium was at first necessarily high—it began at £5 5s. per cent. on August 5, and fell gradually to £1 1s. on December 31—and the inevitable uncertainty as to its final incidence as between buyer and seller naturally caused great difficulty; but from that date it became at least possible to ship goods against foreign orders.

State Marine Insurance.

The next step was to rehabilitate the money market and the foreign exchanges. The details of the measures adopted with this view are beyond our present scope, and we must confine ourselves to the statement that they were gradually effective in making it possible,

though not easy, to finance the production and export of goods, and to obtain payment for them from foreign debtors. At a later stage the government also took up the question of assisting traders who had debts due to them by the enemy, and finally they established a system of guaranteed loans through the banks to cotton brokers, to enable them to get the Exchanges open again.

Money Market.

As to the raw material, the Liverpool Cotton Exchange had at once adopted a restricted system for dealing in "spot" cotton. Prices were fixed and gradually lowered in consultation with New York, but the result of this artificial maintenance of prices was that the actual price of American cotton in the Southern States was very far below the theoretical price of the Liverpool Exchange; and as no one could possibly tell what the ultimate price would be, trading was restricted within the narrowest possible limits, no one buying cotton unless for immediate requirements. At the same time a good deal of direct buying apart from the Exchange went on in Lancashire, and many spinners obtained cotton by this means at prices much lower than those obtainable through the ordinary channels. The policy of the Liverpool Cotton Association naturally drew a good deal of criticism from the various interests affected, especially among the spinners.

Cotton Buying.

Our chief concern here, however, is the effect of the war and the consequent condition of the cotton trade on the position in cotton-growing countries. In America the price of actual cotton in the Southern States fell very rapidly, and by November had got down to nearly

seven cents. In view of the opinions already expressed by the writer in earlier chapters, it is unnecessary to emphasize the fact that this price is below the real cost of production, and that the position is therefore very bad indeed for the cotton growers. There can be no question as to what the effect will be, though it is not easy to guess how far it will go. The planters next year will more or less restrict the acreage under cotton, and turn their attention to mixed farming. There will be no need for any organized movement in favour of restriction; the thing will organize itself, and the effect upon the future cotton supply is likely to be very serious indeed. But the first question which the American cotton world had to face was what was to be done with the current crop, for it was obvious that it could not all be sold under existing conditions, especially as it became evident that the crop was going to be so large. Many schemes were put forward, one of which was the formation of private clubs with the motto, "Buy a bale of cotton." Every member was to buy a bale and hold it for at least a year, and it was said that something like a million bales were taken up in this way. The really serious difficulties, however, of carrying over any material portion of so huge a crop were storage and finance. As has already been pointed out, the storage accommodation throughout the American Cotton Belt is insufficient even under normal conditions, and a few years ago all the stores in the country would not have held more than 5,000,000 bales. Although

Effect on the Growers.

America.

Restricting Acreage.

Storage Difficulty.

a great improvement has taken place in this respect during the last year or two, it is still probable that there is not storage accommodation in the country for half the 1914 crop, so that a great deal of cotton will have to be sold somehow, or left lying out in the open for an indefinite time. As the latter practice, however, is very far from uncommon in normal times, it will probably cause less anxiety to holders of cotton than it should.

The greatest difficulty, however, about carrying over a large part of the crop was that most of the planters had not enough money to finance it. As already explained, the average small farmer does not possess much reserve of cash; it frequently takes him all his time to pull through the growing season, and he is compelled to sell at the first possible moment after his crop is ready. The ordinary banking system of the south was regarded as quite unable to deal with such a proposal as the financing for a year or more of the unsold balance expected from the 1914 crop. It was therefore thought that some government assistance would be necessary in these abnormal conditions, and many people thought that the British Government might take a share in bearing the burden. Sir Charles Macara, for example, proposed that the idea of a cotton reserve orginally put forward at the International Federation's first Congress in 1904 should be taken up by the British Government. The suggestion was that they should buy up a large quantity of cotton at a fixed price, and hold it till better times came, thus assisting to prevent the debacle of prices, which at

Financing the Crop.

Proposed Cotton Reserve.

the time when Sir Charles's proposal was made seemed more than probable. This proposal, however, did not find much favour; but a financial expert was sent out by the Treasury to America to discuss the whole position of trade and the exchanges, and although no announcement was made, arrangements seem to have been come to which for the time at least promised to meet the difficulty fairly well.

Federal Reserve Banks.

The establishment of the Federal Reserve Banks, which only came into actual being on November 16, 1914, provided an organization through which the United States Government were able to render effective assistance. At the same time a scheme was evolved for the provision by private bankers, outside as well as inside of the Cotton Belt, of a pool of £27,000,000 to assist in financing the crop. This, however, seems to have been largely abortive, or to have proved unnecessary.

Till about the end of October prices fell steadily, and things were looking about as black as they could be. No one had any faith in the market, either one way or the other; but the general impression was that things would probably go lower still, and no one could say how low. In the last week of October, however, without any very easily definable cause,

The Turn.

the market suddenly turned. Some large yarn orders were booked, and spinners began to buy cotton; and from then till the end of the year prices were remarkably steady, with latterly an upward tendency. The Liverpool Exchange was reopened on November 6, trading being, however, confined within certain limits, which were gradually withdrawn. New

York opened on November 16,* and by that time there seemed to be a returning feeling of confidence that the catastrophe of low prices, which had at one time appeared to be inevitable, was likely to be avoided. Prices of course fell a little further when the Exchanges were reopened, but nothing like so much as had been feared, and the lowest spot price touched by American Middling was 4·25d. in the second week of December. Considering that in 1911-12, the year of the previous record crop, cotton touched 4·92d., and that the 1914 crop was likely to exceed that record, these prices were really remarkable under the circumstances. It was, by the way, one of the interesting by-products of the war that, especially in America, when the cotton trade found themselves for three months deprived of the facilities afforded by the futures exchanges, they began to realize as they had never done before, the valuable functions which futures serve, and there was actually some talk of repealing the anti-futures laws, both state and federal.

Exchanges Reopened.

In India the difficulties seem to have been met, if anything, more quietly and with less appeal to the government than anywhere else. The explanation probably lies in the fact that India is not entirely dependent upon outsiders for the consumption of her cotton, because her own mills and domestic consumption normally employ a large part of it themselves, and may do so to a still greater extent.

India.

* With the new form of futures contract under the Lever Act in full force, it only remained to secure the adoption by the European Exchanges of the American Government grades, and for this purpose Washington representatives were sent to Europe.

Latterly a scheme was announced for the advance by government of £4,000,000 from the Paper Currency Reserve through the Presidency Banks, to enable loans to be made on cotton, but it was not anticipated that there would be any great demand for this assistance.

The most extreme of all, however, were the steps taken in Egypt to meet the crisis. First of all, the Egyptian Government sent a commission to London and Lancashire to find out what proportion of the crop was likely to be sold during the current season; and they apparently formed an estimate of about 5,000,000 kantars. At that time the authorities were expecting a crop of 8,000,000 kantars, and they immediately passed a law restricting the area for the 1915 crop to 1,000,000 feddans, a reduction of fully 40 per cent. as compared with 1914. The decree also provided that each landholder was to plant only one-fourth of his holding with cotton, instead of about one-half, as is now customary. Later on, when the serious failure of the crop to come up to the original estimate became evident, and the expectation was reduced to little over 6,500,000 kantars, these restrictions were considerably modified. In particular the restriction of the cotton proportion to one-fourth of the whole was modified to one-third, and the absolute limitation to 1,000,000 feddans was waived, but the provision in the original decree entirely forbidding cotton cultivation on the basin lands of Upper Egypt was maintained. As the result of these provisions the government estimated the area for 1915 at 1,250,000 feddans, and that *on the basis of a normal yield* the crop should be about

Egypt.

Legislative Restriction.

5,500,000 kantars. In view, however, of the possibility of damage by the pink boll-worm, it seems rather risky to estimate on the basis of what used to be regarded as the normal yield until at least some effective method of dealing with the new pest has been more generally adopted.

Financing the Crop.

With regard to the financing of the existing crop, the Egyptian government found it obligatory to take an active share in the measures rendered necessary by the emergency, and this implied their borrowing money. It was therefore announced that they proposed to raise altogether £8,000,000, of which the British Government had agreed to guarantee £5,000,000. The usual expansion of the gold-supply in Egypt, which takes place every autumn by a heavy import of gold from England, being, of course, impossible in 1914, a large amount of paper currency was issued in the form of notes of the National Bank of Egypt; and the fellaheen, in marked contrast to their previous unwillingness to accept any form of paper money, were glad to accept these for their cotton. The government next proposed to buy cotton outright from the smallest owners at "a reasonable price," and to make considerable advances to large owners on lots of not less than 100 kantars. The importance of these rather heroic measures, however, was considerably minimized by the subsequent course of events. In the first downward rush of

Effect on Prices.

prices after the outbreak of the war, as will be seen from Table F., III., in the Appendix and the relative diagram, Egyptian cotton gave way less rapidly than American and others, and up till the end of November the divergence of the two prices

had resulted in Egyptian cotton rising again to a premium of nearly 60 per cent. over American. From that time, however, the position was entirely reversed: American took an upward turn, and Egyptian remained at its lowest, until in the third week of January the premium had once more fallen below 30 per cent.

In discussing the prospects for the future the prophet is, of course, always on very unsafe ground, and never more so than now when everything depends upon the unknown factor of the probable date of peace. One danger, however, must be reckoned with. Should the war come to an end, say, during the summer of 1915, after the world's cotton crops for the year are planted (with a greatly reduced acreage), it is fairly probable that the cotton trade will recover pretty rapidly from the depression due to the war. It has shared but little in the sudden demand for war materials, which has given the wool trade the busiest spell it has known for many years, but it is likely to revive all the more quickly when peace returns. Any material revival of the cotton trade during the winter of 1915-16 would almost certainly produce a shortage of the raw material; for it is doubtful whether the unsold balance of the 1914 crops and the reduced crops of 1915 will together make up more than a normal year's crop. Should the demand of 1915-16 prove anything more than normal, we would be faced with the prospect of a sharp rise in prices, and we should have to wait twelve months for the 1916 crops to bring an in-

Future Prospects.

Possible Shortage.

creased supply again. Then would come the real problem of the after-effects of the war. Will the American planters' experience of mixed farming be sufficiently successful to discourage them from returning to the exclusive cultivation of cotton? The advantages of mixed farming under the conditions now existing in the Southern States have already been referred to. It is a question upon which prophecy is of little value, and all that can be done in the meantime is to recognize the possibility that the American crop may refuse to come up to its old figure again unless at a very high price. Such a possibility will hardly be relished by European cotton spinners, who, in the summer of 1914, had a striking object-lesson in the danger of high prices and falling margins.

The fact must therefore be faced that a very low price for cotton during the war may mean a very high price later on, and the longer the war lasts, with the consequent dislocation of the demand for cotton, the more difficult will become the ultimate problem of the revival of the supply. What, for example, will be the effect on the British Cotton Growing Association in West Africa, with their obligation to pay the natives a fixed price for seed cotton?*

Low Prices Dangerous. It may seem paradoxical in view of the persistent outcry of the cotton trade against high prices during the last ten or fifteen years, yet it is nevertheless true that, from the point of view of the supply of raw material, the greatest danger to the cotton trade just now is too low prices. For all these years their constant cry has been for more cotton.

* The fixed price had of course to be reduced (to ¾d. per pound), and the local governments made new arrangements with the Association.

For the time being the situation is reversed, and the difficulty is to know what to do with the excess of the world's cotton crops over the demand, so suddenly and materially reduced by the war. But that reduction can only be temporary. The population of Europe will certainly be reduced by the war, and its purchasing power infinitely more so; but cotton is the cheapest form of clothing in the world, and the demand for it is inexorable, especially in the East, where the effects of the war are least felt. If it should happen that the American area refuses to rise again to the old figure, or even to continue to increase, the problem of the world's cotton supply in 1916, or when the war is over, will be more acute than ever.

Redistribution of Demand.

There will inevitably be a considerable redistribution of the demand of the cotton-spinning industry. The cotton industry of Austria and Germany is certainly suffering much more than that of England. That of Belgium is, of course, for the moment practically wiped out of existence; while the cotton districts of the north of France round Lille can hardly be much better, and even those of Lyons and the south must be suffering considerably. The Russian industry is peculiarly favourably placed by having a large part of its supply within its own borders in Russian Turkestan, and will probably come through the war with comparatively little loss. They can also import American cotton freely in summer by Archangel, and even in winter via Vladivostock and the Trans-Siberian Railway. The cotton industries in the neutral countries of Europe; *i.e.*, Norway, Sweden, Denmark, Holland, Switzerland, Italy,

European Countries.

Spain, and Portugal, stand a chance of gaining as much as they lose by the war through the withdrawal of the competition of their stronger neighbours.

America.

What the effect of the war on the American cotton industry will be, it is difficult to forecast. The low price of the raw material and the handicap imposed upon their European competitors by the war ought to give them a great opportunity, especially in such markets as South America and the Far East, and the opening of the Panama Canal should also improve their position with regard to these trades. Here, however, they will meet another powerful rival in Japan; indeed, the possible developments of the Oriental cotton manufacturing industry as a result of the war are perhaps the most interesting of all.

India, China, and Japan.

India, China, and even Japan, now that the Germans are cleared out of the Pacific, are practically out of the war. They have an ample supply of cheap raw material at their own doors in India, China, and Korea, and, by the opening of the Panama Canal, China and Japan will be brought as near the Gulf cotton ports as we are. The reduction in the price of the raw material, and the removal of German, and to some extent also of English competition, will give them a chance which they will be quick to seize, of establishing their foothold in their own markets, and it must be remembered that these are the largest in the world for the kind of goods they can best produce.

Eastern Markets.

It is, therefore, quite probable that the war will result in a very marked change in the cotton industry of India,

China, and Japan, which together possessed in 1912-13 about 9,000,000 spindles.*

But the result will not be a diminished demand for cotton. More cotton growing and manufacturing in the East means more money to spend, and the first direction in which increased expenditure will tend is more clothing, chiefly cotton. The possibilities of demand from a population of 750,000,000 are incalculable, and there is very little doubt that the effect of any expansion of the cotton industry in the Far East will be at least sufficient to take up their own increasing cotton crops. If, then, America continues to increase her manufactures without a proportionate increase of the crop, and if China and Japan increase their own mill and domestic consumption as fast as their crops, where is Europe to look for her increased supply, especially of good cotton ?

Possible Demand.

There will, of course, be some redistribution of the cotton-growing area as well. Germany can hardly expect to have all her old colonies returned to her after the war, and a possible redistribution may affect the position of Togoland and German East Africa, which, as we have seen, were the best of her African colonies from the point of view of cotton growing. Asia Minor and Mesopotamia may have a chance under a new régime to develop their great

German Colonies.

* On the other hand, it is said that the Japanese cotton industry has reached its high-water mark. Labour is not easy to obtain, and the government are stopping the habitual night-work, which was the peculiarity of the industry. The recent increase of spindleage was chiefly in preparation for this, and we may look for a reduced consumption per 1,000 spindles.

possibilities. But one thing is certain: when the war is over we shall require an increased supply, especially of fine cotton, and we must look for it mainly to our own Empire, especially in India and Africa. We shall then want not merely a British Cotton Growing Association with a capital of a paltry half-million, but an organization of the size of a State Department, with all the governments of the British Empire behind it, and a capital of about as much as is being spent on this war in a day, say, £10,000,000.

The B.C.G.A. of the Future.

STATISTICAL APPENDIX

LIST OF STATISTICAL AUTHORITIES.

Authority or Publisher.	Title of Report or Publication.	Short Reference.
U.S.A. Department of Commerce, Bureau of the Census	Annual Bulletin, "Cotton Production"	C.P.
	Annual Bulletin, "Supply and Distribution of Cotton"	S.D.C.
U.S.A. Department of Agriculture, Bureau of Statistics	Year-Book of the Department of Agriculture	Y.D.A.
Comtelburo, Ltd.	Jones's Annual Cotton Handbook (formerly "Handbook for Daily Cable Records")	Jones.
Shepperson Publishing Co., New York ..	"Cotton Facts" (annual)	Shepperson.
H.M. Stationery Office	Statistical Abstract (annual) for the Principal and Other Foreign Countries	S.A.F.C.
	Statistical Abstract (annual) for the British Empire	S.A.B.E.
	Consular Reports	C.R.
	Colonial Reports	Cl.R.
British Cotton Growing Association ..	Annual Reports, etc.	B.C.G.A.
International Federation of Master Cotton Spinners and Manufacturers' Associations	Reports of Congresses, and Annual and Semi-Annual Statistics	I.F.
Liverpool Cotton Association	Weekly Circular and Annual Statement	L.C.A.
Turner Routledge and Co., Liverpool ..	Annual "Cotton Diagram"	
Alexandria General Produce Association	Weekly Bulletins and Annual Statement	A.G.P.A.
International Congresses of Tropical Agriculture, 1910 and 1914	Papers and Reports on Cotton Cultivation, 1910 and 1914	I.C.T.A.
Association Cotonnière Coloniale ..	Quarterly Reports	A.C.C.
Kolonial-Wirtschaftliches Komitee ..	Unsere Kolonialwirtschaft in ihrer Bedentung für Industrie Handel und Landwirtschaft, 1914; and Annual Reports, etc.	K.W.K.
Egyptian Government Statistical Department	Annuaire Statistique de l'Égypte	A.S.E.
Egyptian Government Statistical Department	Monthly Return, showing the state and prospects of the Egyptian cotton crop	

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* See also under Section A, list of other tables in the text, and Section F for prices.

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GENERAL NOTE.

THE main objects of these statistics are (1) to present a general view of the world's supply and consumption of cotton, so far as it has been found possible to obtain statistical information on the subject; and (2) to accumulate such information as is available with regard to each of the world's chief crops.

The sources of the various statistics are stated in every case, and wherever the author has found it necessary, through lack of any other data, to fill a gap in the statistics with an estimate of his own, the fact is indicated by distinctive type (*italics*).

The general arrangement of the Appendix is as follows:

Section A. Production.
Section B. Consumption.
Section C. America.
Section D. India.
Section E. Egypt.
Section F. Prices.

SECTION A.

TABLE A, I. THE WORLD'S CROPS.—The variation of the bale weight is the chief difficulty here, and the author's endeavour has been to keep as nearly as possible to 500 pounds as a standard weight without departing too often from published statistics with which the cotton world is familiar. Thus, the actual American bale averages about 510 pounds gross, or, say, 478 to 490 pounds net. The Indian bale is supposed to average only about 400 pounds net, though in recent years many of the ginneries, especially in the south, have been putting up a 500-pound bale. It is believed, however, that the shortage in the bale weight may be set against the generally accepted fact that the figures given are considerably below the real total of the crop, and to be on the safe side the author has taken the lowest of the various estimates

given in Table D, I. The actual Egyptian bale averages about 720 to 740 pounds net, but for the purposes of this table the Egyptian statistics, which are in kantars of 99·05 pounds, have been converted into theoretical bales of 5 kantars, or 495·25 pounds. The statistics of the other crops have been converted as nearly as possible to 500-pound bales. Those of the foreign colonies are usually stated in the original tables in kilos, or bales of 250 kilos = 550 pounds, and have been converted at that ratio. In the sphere of influence of the British Cotton Growing Association the standard bale is 400 pounds.

TABLE A, III. THE SMALLER CROPS.—It is here that the statistical difficulty has been the greatest. The author has collected and collated statistics from many sources, but has seldom found two of them agreeing. In the circumstances, the only method which could claim any scientific sanction at all was to take an arithmetical mean or average of the various estimates—a method which, it need hardly be said, is open to many objections, yet which probably results in as near an approximation to the truth as it is possible to arrive at, with the present unsatisfactory data. The various sources from which these data have been taken, and the detailed figures from which the mean totals have been calculated, are given in this table, and the author will be very grateful to any reader who can either correct these figures or supplement them by other statistical information, from official sources or otherwise.

SECTION A.—PRODUCTION.

TABLE A, I.—THE WORLD'S COTTON CROPS, 1902-1914.

BALES OF APPROXIMATELY 500 POUNDS (000's OMITTED).

	1902–03.	1903–04.	1904–05.	1905–06.	1906–07.	1907–08.	1908–09.	1909–10.	1910–11.	1911–12.	1912–13.	1913–14.	1914–15.
Author's Calculation:													Estimates
America (see p. 418)	10,758	10,124	13,557	11,320	13,551	11,582	13,829	10,651	12,132	16,043	14,129	14,610	*16,500*
India (see p. 419)	3,367	3,161	3,791	3,416	4,934	3,122	3,692	4,718	3,853	3,288	4,395	5,201	*5,000*
Egypt (see p. 294)	1,168	1,302	1,263	1,192	1,390	1,447	1,150	1,000	1,515	1,485	1,607	1,537	*1,300*
Russia (see p. 397)	342	477	536	604	759	664	698	686	895	875	911	1,015	*1,300*
China (see p. 397)	1,200	1,200	756	788	806	875	1,933	2,531	3,467	3,437	3,931	4,000	*4,000*
Others (see p. 396)	801	751	803	936	1,027	950	969	950	967	1,058	1,171	1,340	*1,300*
Total	17,636	17,015	20,706	18,256	22,467	18,640	22,271	20,536	22,829	26,186	26,044	27,703	*29,400*
Other Estimates:													
Jones	17,913	18,152	20,633	19,457	22,473	19,851	22,391	19,409	24,027	27,560	27,476	29,303	—
Cotton Production	—	—	18,803	15,747	19,942	16,512	19,698	16,241	18,027	21,269	20,976	22,255	—
Y.D.A.	17,332	17,279	21,005	18,342	22,183	18,329	23,688	20,679	22,433	25,650	24,697	—	—
Shepperson ..	—	—	—	—	—	—	—	19,623	22,802	26,439	26,903	28,774	—
Early Records:	1876–77.	1877–78.	1878–79.	1879–80.	1880–81.	1881–82.	1882–83.	1883–84.	1884–85.	1885–86.	1886–87.	1887–88.	1888–89.
Jones	7,271	7,214	7,037	8,252	9,285	8,538	10,280	9,028	8,876	9,396	10,077	10,623	10,413
	1889–90.	1890–91.	1891–92.	1892–93.	1893–94.	1894–95.	1895–96.	1896–97.	1897–98.	1898–99.	1899-1900.	1900–01.	1901–02.
Jones	11,376	12,522	12,842	10,590	11,771	13,619	11,923	13,501	15,959	16,442	14,394	15,513	16,739
Y.D.A.	—	—	—	—	—	—	—	—	—	—	—	15,894	15,926

TABLE A, II.—SMALLER CROPS: SUMMARY OF MEAN TOTALS, 1902-1914.

IN 500-POUND BALES (000'S OMITTED).

Country.	For Details, see—	1902–03.	1903–04.	1904–05.	1905–06.	1906–07.	1907–08.	1908–09.	1909–10.	1910–11.	1911–12.	1912–13.	1913–14.
Persia ..	p. 398	54	47	78	65	72	77	74	115	116	113	136	142
Europe and Asia Minor	p. 398	88	90	102	113	131	141	134	133	157	174	178	196
Mexico ..	p. 400	117	124	164	185	209	110	181	162	157	158	164	145
Brazil ..	p. 400	381	311	251	364	409	380	325	268	297	300	338	426
Peru ..	p. 400	36	42	64	58	59	73	79	94	93	96	106	142
Other South American..	p. 401	4	6	5	5	8	11	12	11	11	19	21	30
West Indies, British ..	p. 329	1	1	2	2	3	5	5	5	4	6	5	5
West Indies, Others ..	p. 402	6	7	8	10	9	11	12	10	10	12	12	9
East Indies and Oceania	p. 404	13	19	20	19	20	21	31	30	31	29	31	38
Japan ..	p. 403	19	18	16	15	16	11	6	5	6	6	7	7
Korea ..	p. 403	70	70	70	70	60	70	69	70	32	65	85	98
Indo-China	p. 403	11	13	15	19	15	15	17	15	12	21	21	34
Africa, British ..	p. 200	1	3	6	8	12	19	18	23	30	44	51	50
Africa, Others ..				2	3	4	6	6	9	11	15	16	18
Total		801	751	803	936	1,027	950	969	950	967	1,058	1,171	1,340

TABLE A, III.—RUSSIA, CHINA, AND SMALLER CROPS, 1902–1914.

DETAILS OF VARIOUS ESTIMATES, SHOWING MEAN TOTALS (IN 500-POUND BALES).

	1902–03.	1903–04.	1904–05.	1905–06.	1906–07.	1907–08.	1908–09.	1909–10.	1910–11.	1911–12.	1912–13.	1913–14.
RUSSIA.												
Y.D.A. ..	426,000	529,000	504,000	539,000	687,503	†448,745	†531,541	†417,861	†690,553	†693,164	†666,578	—
Jones ..	{250,000	425,000	550,000	612,000	675,000	797,000	710,000	715,000	945,000	960,000	900,000	1,000,000
	{350,000	*	*	678,000	1,019,000	791,000	705,000	709,000	856,000	821,000	1,073,000	—
C.P.	—	—	554,000	585,000	655,000	620,000	846,000	785,000	981,000	939,000	917,352	1,004,328
Shepperson ..	—	—	—	—	—	—	—	800,000	1,000,000	960,000	1,000,000	1,040,000
Mean total..	**342,000**	**477,000**	**536,000**	**603,500**	**759,126**	**664,186**	**698,135**	**685,372**	**894,511**	**874,633**	**911,386**	**1,014,776**
CHINA.												
Y.D.A. ..	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	4,000,000	4,000,000	4,000,000	4,000,000	4,000,000	—
Jones ..	1,200,000	1,200,000	600,000	750,000	800,000	1,000,000	1,200,000	1,200,000	4,181,000	4,181,000	5,300,000	5,300,000
C.P.‡ ..	—	—	468,000	415,000	418,000	426,000	600,000	600,000	775,000	625,000	1,074,000	1,200,000
Shepperson ..	—	—	—	—	—	—	—	2,675,000	4,200,000	4,200,000	5,350,000	5,500,000
Ministry of Agriculture	—	—	—	—	—	—	—	4,181,000	4,181,000	4,181,000	—	—
Mean ..	**1,200,000**	**1,200,000**	**756,000**	**788,333**	**806,000**	**875,333**	**1,933,333**	**2,531,200**	**3,467,400**	**3,437,400**	**3,931,000**	**4,000,000**

* Incomplete. † Not including Bokhara and Khiva (see p. 67). ‡ Commercial crop only.

TABLE A, III.—*Continued.*

DETAILS OF VARIOUS ESTIMATES, SHOWING MEAN TOTALS (IN 500-POUND BALES).

	1902–03.	1903–04.	1904–05.	1905–06.	1906–07.	1907–08.	1908–09.	1909–10.	1910–11.	1911–12.	1912–13.	1913–14.
PERSIA.												
Y.D.A.	64,000	56,282	71,509	81,931	91,431	89,689	83,985	128,031	123,277	85,878	128,709	—
Jones	33,000	30,000	125,000	50,000	60,000	80,000	80,000	114,000	114,000	128,000	140,000	140,000
S.A.F.C.	64,000	56,000	72,000	82,000	91,000	90,000	84,000	128,000	124,000	106,000	—	—
Cotton Production	—	—	45,000	47,000	47,000	50,000	50,000	116,000	117,000	120,000	137,000	140,000
Shepperson	—	—	—	—	—	—	—	90,000	100,000	125,000	140,000	145,000
Mean	53,667	47,427	78,377	65,233	72,358	77,422	74,496	115,206	115,655	112,976	136,427	141,667
EUROPE AND ASIA MINOR.												
Bulgaria: Y.D.A.	765	731	772	864	874	604	691	783	1,137	917	917	917
Crete: Y.D.A.	700	700	700	700	700	700	700	700	700	700	700	700
Greece:												
Y.D.A.	8,200	8,200	8,200	8,200	10,147	8,200	8,200	8,200	32,285	23,615	23,615	—
Jones	4,000	10,000	10,000	10,000	10,000	15,000	20,000	15,000	15,000	30,000	30,000	30,000
Cotton Production	—	—	—	—	8,400	20,000	20,000	15,500	9,000	—	*22,400	—
Mean ..	6,100	9,100	9,100	9,100	9,516	14,400	16,067	12,900	18,762	26,808	25,338	30,000

Italy:												
Y.D.A.	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	—
Jones	—	—	3,000	10,000	3,000	5,000	1,000	3,000	3,000	3,000	3,000	3,000
Mean ..	**2,700**	**2,700**	**2,850**	**6,350**	**2,850**	**3,850**	**1,850**	**2,850**	**2,850**	**2,850**	**2,850**	**3,000**
Malta:												
Y.D.A.	231	285	345	340	348	443	364	379	411	392	975	—
S.A.B.E.	221	272	330	325	333	423	348	362	393	375	490	†542
Mean ..	**226**	**279**	**338**	**333**	**340**	**433**	**356**	**370**	**402**	**384**	**733**	**542**
Cyprus:												
Y.D.A.	817	692	1,118	1,637	3,361	4,110	3,860	3,436	5,102	7,230	7,632	—
Jones	1,000	1,000	1,000	1,000	2,000	3,000	2,000	2,000	2,000	4,000	4,000	4,000
S.A.B.E.	781	674	1,068	1,565	3,213	3,929	3,690	3,284	4,878	6,911	7,296	—
Mean ..	**866**	**789**	**1,062**	**1,401**	**2,858**	**3,680**	**3,183**	**2,907**	**3,993**	**6,047**	**6,309**	**4,000**
Turkey:												
Y.D.A.	68,000	67,000	66,000	67,000	141,000	141,000	141,000	141,000	141,000	141,000	141,000	—
Jones	*85,000	85,000	95,000	108,000	93,000	130,000	112,000	94,000	164,000	156,000	195,000	195,000
Cotton Production	—	—	100,000	107,000	107,000	80,000	80,000	108,000	105,000	124,000	115,000	130,000
Shepperson ..	—	—	—	—	—	—	—	108,000	105,000	124,000	115,000	145,000
Mean ..	**76,500**	**76,000**	**87,000**	**94,000**	**113,667**	**117,000**	**111,000**	**112,750**	**128,750**	**136,250**	**141,500**	**156,667**
Total	**87,857**	**90,299**	**101,822**	**112,748**	**130,805**	**140,667**	**133,847**	**133,260**	**156,594**	**173,956**	**178,347**	**195,784**

* C.R., 5,224. † Exports.

P.S.—The Statistical Abstract figure for Cyprus in 1913 (9,230 bales) was received too late to be given effect to in the total and in the other tables.

TABLE A, III.—*Continued.*

DETAILS OF VARIOUS ESTIMATES, SHOWING MEAN TOTALS (IN 500-POUND BALES).

	1902–03.	1903–04.	1904–05.	1905–06.	1906–07.	1907–08.	1908–09.	1909–10.	1910–11.	1911–12.	1912–13.	1913–14.
MEXICO.												
Y.D.A.	103,910	168,998	253,271	227,134	270,000	70,000	269,713	269,713	200,455	200,455	200,455	—
Jones	124,000	80,000	160,000	250,000	276,000	90,000	140,000	125,000	135,000	200,000	200,000	135,000
S.A.F.C.*	123,000	122,000	127,000	139,000	161,000	211,000	176,000	159,000	159,000	156,000	131,000	—
Cotton Production ..	—	—	114,000	125,000	130,000	70,000	140,000	125,000	147,000	130,000	140,000	150,000
Shepperson	—	—	—	—	—	—	—	130,000	145,000	105,000	150,000	150,000
Mean	116,970	123,666	163,568	185,283	209,250	110,250	181,428	161,743	157,291	158,291	164,291	145,000
BRAZIL.												
Y.D.A.	305,000	285,000	220,000	270,000	365,000	348,000	231,000	265,000	270,000	270,000	270,000	—
Jones†	533,500	364,342	352,618	656,000	632,000	465,000	314,000	225,000	354,000	316,000	469,000	448,000
S.A.F.C.	305,000	285,000	220,000	270,000	365,000	348,000	231,000	265,000	270,000	320,000	310,000	—
Cotton Production ..	—	—	210,000	258,000	275,000	370,000	425,000	225,000	280,000	275,000	315,000	420,000
Shepperson	—	—	—	—	—	370,000	425,000	360,000	310,000	320,000	325,000	410,000
Mean	381,167	311,447	250,654	363,500	409,250	380,200	325,200	268,000	296,800	300,200	337,800	426,000
PERU.												
Y.D.A.	38,200	43,776	45,672	49,190	58,283	66,804	73,884	98,262	65,059	72,813	88,694	—
Jones	32,000	37,000	125,000	90,000	70,000	110,000	102,000	92,000	128,000	128,000	140,000	176,000
S.A.F.C.	38,000	44,000	46,000	49,000	58,000	67,000	58,000	45,000	77,000	73,000	73,000	—
Cotton Production ..	36,500	—	40,000	55,000	55,000	55,000	80,000	107,000	95,000	100,000	110,000	110,000
I.C.T.A.	—	—	—	46,926	55,598	63,729	80,652	107,091	—	—	—	—
Shepperson	—	—	—	—	—	—	—	115,000	100,000	108,000	120,000	140,000
Mean	36,175	41,592	64,168	58,023	59,376	72,507	78,907	94,059	93,012	96,363	106,339	142,000

OTHER SOUTH AMERICAN.												
Colombia and Venezuela:												
Y.D.A.	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Jones	1,000	4,000	2,000	1,000	5,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Mean	3,000	4,500	3,500	3,000	5,000	7,500	7,500	7,500	7,500	7,500	7,500	7,500
Ecuador:												
Y.D.A.	28	—	22	47	47	34	15	49	316	184	184	184
Chile:												
Y.D.A.	860	1,182	634	1,335	1,357	1,134	979	788	708	636	905	905
British Guiana:												
Y.D.A.	—	—	4	2	1	—	—	—	—	—	—	—
Argentine:												
Y.D.A.	17	26	142	495	2,000	2,000	2,000	2,000	2,000	18,449	18,449	18,449
Jones	—	500	500	1,000	1,000	2,000	5,000	—	2,000	2,000	5,000	5,000
Mean	17	263	321	748	1,500	2,000	3,500	2,000	2,000	10,225	11,725	11,725
Paraguay: Y.D.A. ..	200	200	200	200	200	200	200	200	200	200	200	200
Uruguay:												
Cotton Production	—	—	—	—	—	—	—	—	—	—	—	9,372
Total ..	4,105	6,145	4,681	5,332	8,105	10,868	12,194	10,537	10,724	18,745	20,514	29,886

* Exports and home consumption (mill), the latter probably of previous year's crop.

† Exports and coastwise shipments. Bale weight uncertain, though stated at 2¼ hundredweights; average is probably between 300 and 400 pounds.

TABLE A, III.—*Continued.*

DETAILS OF VARIOUS ESTIMATES, SHOWING MEAN TOTALS (IN 500-POUND BALES).

	1902-03.	1903-04.	1904-05.	1905-06.	1906-07.	1907-08.	1908-09.	1909-10.	1910-11.	1911-12.	1912-13.	1913-14.
WEST INDIES (FOREIGN).												
Cuba:												
Y.D.A.	—	77	61	21	1	—	—	—	—	—	—	—
Porto Rico:												
Y.D.A.	—	265	1,076	1,831	220	446	399	240	342	412	447	*400*
Dutch Islands:												
C.R.	—	—	—	—	—	—	—	80	53	207	*200*	*200*
Danish Islands:												
Y.D.A.	—	—	—	—	505	505	505	455	506	519	*580	*263
French Islands: ..												
Y.D.A.	1	1	13	7	14	10	26	12	12	8	8	8
A.C.C.	—	—	—	—	—	4	71	30	9	—	—	—
Mean ..	1	1	13	7	14	7	49	21	11	8	8	8
Haiti:												
Y.D.A.	4,200	6,821	6,312	6,878	8,086	7,092	7,092	7,550	7,867	10,997	9,113	—
Jones	7,000	7,000	7,000	10,000	7,000	10,000	15,000	10,000	10,000	11,000	11,000	5,000
Cotton Production	—	—	—	—	10,000	15,000	15,000	10,000	—	11,000	—	—
C.R.	—	—	—	—	—	6,770	7,218	7,648	—	8,396	8,678	8,575
Mean ..	5,600	6,911	6,656	8,439	8,362	9,715	11,078	8,799	8,934	10,348	9,597	6,788
San Domingo:												
C.R.	—	—	—	—	—	—	—	—	275	750	1,540	1,088
Total	5,601	7,254	7,806	10,298	9,102	10,673	12,031	9,595	10,121	12,244	12,372	8,747

JAPAN.												
Y.D.A.	19,152	17,012	16,262	12,370	9,238	8,195	6,437	5,630	4,158	4,215	—	—
Jones	—	19,000	16,000	20,000	35,000	15,000	6,000	5,000	7,000	7,000	7,000	7,000
S.D.C.	—	—	—	13,790	10,039	10,053	—	—	5,000	—	—	—
Cotton Production ..	—	—	16,000	15,000	11,000	9,000	6,000	5,000	—	—	—	—
Shepperson	—	—	—	—	—	—	—	—	7,400	7,000	7,500	7,000
Mean	19,152	18,006	16,087	15,290	16,319	10,562	6,146	5,210	5,889	6,072	7,250	7,000
KOREA.												
Y.D.A.	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	35,994	63,450	85,465	—
Jones	—	70,000	70,000	70,000	50,000	70,000	67,000	70,000	25,000	63,000	85,000	98,000
C.R., 4,899	—	—	—	—	—	—	—	—	34,666	67,880	—	—
Mean	70,000	70,000	70,000	70,000	60,000	70,000	68,500	70,000	31,887	64,776	85,232	98,000
INDO-CHINA.												
Y.D.A.	11,139	13,693	15,255	18,103	11,082	15,877	20,968	14,138	9,451	8,709	8,709	—
Jones	—	12,000	15,000	20,000	15,000	15,000	15,000	15,000	15,000	34,000	34,000	34,000
Cotton Production ..	—	—	—	—	18,000	15,000	15,000	15,000	—	20,000	—	—
Mean	11,139	12,847	15,128	19,052	14,694	15,292	16,989	14,713	12,226	20,903	21,355	34,000

TABLE A, III.—*Continued.*

DETAILS OF VARIOUS ESTIMATES, SHOWING MEAN TOTALS (IN 500-POUND BALES).

	1902–03.	1903–04.	1904–05.	1905–06.	1906–07.	1907–08.	1908–09.	1909–10.	1910–11.	1911–12.	1912–13.	1913–14.
EAST INDIES AND OCEANIA.												
Philippine Islands:												
Y.D.A.	6,098	6,098	6,098	6,098	6,098	6,098	6,098	6,098	6,098	6,098	6,098	6,098
Jones	—	—	6,000	6,000	6,000	6,000	6,000	4,000	4,000	6,000	—	—
Shepperson ..	—	—	—	—	—	—	—	6,100	6,000	6,000	6,100	6,000
Mean ..	**6,098**	**6,098**	**6,049**	**6,049**	**6,049**	**6,049**	**6,049**	**5,399**	**5,366**	**6,033**	**6,099**	**6,049**
Dutch East Indies:												
Y.D.A.	8,267	12,632	15,367	13,280	15,944	19,652	19,932	13,235	14,504	11,902	11,902	—
Jones	5,000	—	12,000	15,000	13,000	12,000	55,000	45,000	45,000	45,000	45,000	45,000
I.C.T.A.	—	12,350	14,542	11,284	12,683	13,169	15,250	—	—	—	—	—
Cotton Production	—	—	—	—	12,400	12,400	10,000	—	25,000	—	—	—
Shepperson ..	—	—	—	—	—	—	—	13,200	14,300	12,000	14,500	15,000
Mean ..	**6,634**	**12,341**	**13,970**	**13,188**	**13,507**	**14,305**	**25,046**	**23,812**	**24,701**	**22,967**	**23,801**	**30,000**

New Guinea, etc. (British and German):												
Y.D.A.	13	240	56	32	38	5	—	—	—	—	—	—
Queensland:												
S.A.B.E.	1	1	17	75	52	73	78	86	101	125	100	24
New Caledonia:												
Y.D.A.	—	—	—	—	—	—	3	16	56	209	923	—
A.C.C.	—	—	—	—	—	—	22	22	66	—	726	1,135
C.R.	—	—	—	—	—	—	2	13	53	194	867	—
Mean ..	—	—	—	—	—	—	9	17	58	202	839	1,135
Society Islands:												
Y.D.A.	79	71	48	39	110	109	70	332	361	127	127	—
I.C.T.A., etc.	75	*69*	—	—	—	—	—	—	*343	*118	†66	†70
Mean ..	77	70	48	39	110	109	70	332	352	123	97	70
Fiji:												
S.A.B.E.	—	—	—	—	—	6	7	—	4	—	—	5
Hawaii:												
C.R., 5,253	—	—	—	—	—	—	—	—	—	—	250	*250*
Total	12,823	18,750	20,140	19,383	19,756	20,547	31,259	29,646	30,582	29,450	31,186	37,533

* C.R., 4,961. † A.C.C.

SECTION B.

TABLE B, I. Three published sources of information as to consumption have been used—namely, the United States Census Bureau Bulletins, the estimates in Jones's Handbook, and the International Federation statistics.* The 'last-mentioned are avowedly not complete—*i.e.*, they state the actual number of spindles making returns, the quantity of cotton of various kinds consumed by these spindles, and the estimated total number of spindles. From these it is possible to calculate by simple proportion the probable total consumption. The full working out of this method is shown in Table B, IV., which is given merely as an illustration. It is, unfortunately, impossible to found upon it as even indicating the consumption of each variety of cotton in each country, because there is no evidence whatever to justify the implied assumption that the spindles not returned are distributed over the various kinds of cotton in the same proportion as those returned. In Great Britain, in fact, it is known that such is not the case, the shortage being chiefly in the Egyptian section of the trade.

A further difficulty arises out of the fact that the Federation statistics are stated in running bales, the weight of which, as already mentioned in the note on Section A, varies in different countries. In the case of the Sundries, consumed especially in Russia and Brazil, the average bale-weight is very uncertain, and probably does not exceed 250 to 350 pounds. On the other hand, the Egyptian bale averages about 750 pounds gross, which must be remembered in comparing the Federation statistics of consumption of Egyptian with the Egyptian crop figures in Table A, I. Taking all these discrepancies into account, it is probable that the total consumption calculated from the International Federation statistics is about 500,000 bales per annum higher than the truth.

TABLE B, II.—In making any attempt at a comparison between the figures of consumption and production, the first difficulty is to estimate the world's domestic consumption. Theoretically, this question does not arise in the comparison of the American estimates of production and consumption, because the crop estimates are avowedly only the commercial crop. Direct comparison of the figures is therefore possible, domestic consumption being omitted on both sides.

With regard to the other two estimates, domestic consumption

* A set of earlier records by Latham, Alexander and Co., New York, is added to the table, but is not made the basis of any argument.

is becoming of much greater importance now, on account of the growing inclusion in crop estimates of the large China crop, which is mostly used by domestic looms and for the wadding of garments. Only about 500,000 bales are used in the local mills, and about 250,000 exported, and by deducting these figures from the total crop, the domestic consumption of China should be obtainable. This, however, is assuming that the total mill consumption is actually included in the published consumption statistics, which is not by any means certain.

Again, in India there is no possibility of obtaining definite information as to the domestic consumption. By arrangement between the Commercial Intelligence Department and the Bombay Cotton Trade Association, it was agreed in 1911 to adopt the conventional estimate of 450,000 bales in place of that of 750,000, formerly in use. Neither figure has the slightest pretence to accuracy.

On the whole, the only practicable way to arrive at an estimate of the world's domestic consumption seems to be to take the total of the China crop, setting off that portion of it which goes to mill consumption and exports against the unknown portion of the Indian crop which goes to domestic consumption. This method is, of course, purely a compromise, but it probably errs on the safe side—*i.e.*, underestimating the domestic consumption.

On this footing it will be seen that the three pairs of estimates of production and consumption nearly balance each other. The United States estimates show an apparent excess of consumption of 627,000 bales per annum. The author's calculation based on the Federation statistics shows a similar excess of consumption of 535,000 bales per annum, but Jones's figures show an average crop balance of 758,000 bales per annum. The difference is due to two facts—namely (1) that Jones's crop estimates are nearly always the highest, and his mill-consumption estimates rather low (see Table B, I.); and (2) that Jones's figures go back a year farther than even the United States figures. The extra year, 1904-05, was admittedly one in which the crop was abundant, and probably did show a considerable surplus over the consumption.

The second part of this table shows another method of comparison, by taking the mean total of the three estimates of consumption and the three crop estimates concerned; this brings out an almost perfect equality between consumption and production. Again, on taking the whole five complete estimates of which the writer has made use in Section A (deducting the China crop from the four, which include the whole of it and the Indian crop), a similar result is obtained, though the

apparent excess of total consumption is considerable. The real similarity of the results is, however, shown by plotting out in diagrams not merely the total production and consumption, but the excess in each year of consumption over production or *vice versa*.

As pointed out in the text, conclusions can only be drawn from these figures with many reservations. Any statistics that seem to show a marked excess of total consumption over total production, or the reverse, are obviously not to be taken literally. But Table B, II., does seem to bear out the writer's contention that the consumption of cotton during the last ten years has only been limited by the supply, and that the steady rise of price (see Section F) is chiefly due to the inability of the supply to increase as fast as the demand could have taken it up. Consumption has, on the whole, increased steadily as contrasted with the spasmodic rise and fall of the total crops, and has actually been in excess of the supply in five out of the ten seasons.

It is interesting to note, also, as will be seen from the diagram on p. 438, that the surplus or shortage of the crop in each season corresponds very closely with the movements of the mean of the American, Indian, and Egyptian season's average prices. On this point it must, of course, be remembered that the total of the world's crops from year to year corresponds very closely with the amount of the American crop* (shown for this purpose on the diagram, along with the average yield per acre), and the general level of cotton prices is very largely influenced by the price of American.

The period of ten years over which the diagram extends is, of course, too short to found any definite statistical argument upon it; but it may at least be taken as showing the danger of our present position, which is too much dependent on the vagaries of the American climate. For it is mainly upon the weather that the average yield of the American crop depends, and these heights and hollows of the curve indicating the world's total crops correspond far too closely with the average yield of the American crop. Put in a nutshell, the situation is that, unless the American crop gets *very* good weather, the world's supply is seriously short of the normal consumption.

* At least it did so until the last few years, when the amount of the Russian, Chinese, and other crops began to be material. On this point compare the relative positions of the lines representing the American crop and the World's total crops in the two sections of the diagram on p. 438. In the one the Chinese crop is excluded ; in the other it is included, and the resulting difference is quite marked.

SECTION B.—CONSUMPTION.

TABLE B, I.—THE WORLD'S CONSUMPTION OF COTTON, 1894–1914.

(000's omitted.)

Season.	U.S.A. Census Bureau (Bales of 500 lbs. gross).	Jones's Handbook (Running Bales).			Calculated from Federation Statistics (Running Bales).			Mean of (1), (4), and (7).	Mean of (1), (2), and (5).
	Mill Consumption.	Mill Consumption.	Domestic.	Total.	Mill Consumption.	Domestic.	Total.		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1894–95 ..	—	13,763	—	—	—	—	—	—	—
1899–1900	15,177	15,700	—	—	—	—	—	—	—
1904–05 ..	—	17,726	600	18,326	—	—	—	18,326	17,726
1905–06 ..	17,879	18,548	750	19,298	—	—	—	18,589	18,214
1906–07 ..	19,493	19,276	800	20,076	19,799	806	20,605	20,058	19,523
1907–08 ..	18,856	19,146	1,000	20,146	20,178	875	21,053	20,019	19,393
1908–09 ..	19,397	19,634	1,200	20,834	20,454	1,933	22,387	20,873	19,828
1909–10 ..	18,321	19,335	1,200	20,535	19,787	2,531	22,318	20,391	19,148
1910–11 ..	19,013	20,515	4,181	24,696	21,138	3,467	24,605	22,771	20,222
1911–12 ..	20,587	21,209	4,181	25,390	22,689	3,437	26,126	24,034	21,495
1912–13 ..	21,542	22,432	5,300	27,732	22,932	3,931	26,863	25,379	22,302
1913–14 ..	21,223*	22,666	5,300	27,966	*23,000*	4,000	*27,000*	25,396	22,296

Early Records.†

Season.	Bales.	Season.	Bales.	Season.	Bales.	Season.	Bales.	Season.	Bales.	Season.	Bales.	Season.	Bales.
1884-85	7,444	1887-88	8,891	1890-91	10,511	1893-94	10,580	1896-97	11,880	1899-1900	13,773	1902-03	14,437
1885-86	8,120	1888-89	9,267	1891-92	10,565	1894-95	11,543	1897-98	12,888	1900-1901	13,416	1903-04	14,010
1886-87	8,505	1889-90	9,795	1892-93	10,291	1895-96	11,605	1898-99	14,015	1901-1902	14,415	1904-05	15,506

* Bales of 500 lbs. net.

† Latham, Alexander and Co., New York, in "Cotton," by Burkett and Poe.

TABLE B, II.—BALANCE OF WORLD'S PRODUCTION AND CONSUMPTION (000's OMITTED).

Season.	U.S.A. Census Bureau (Bales of 500 lbs.).			Jones's Handbook (Running Bales).			Author's Calculations (Running Bales).			Net Balance.	Mean Balance.
	Crops (Commercial).	Consumption (Mill).	Balance Crop + or –.	Crops.	Consumption.	Balance.	Crops.	Consumption (from Federation Statistics).	Balance.		
1904–05	—	—	—	20,633	18,326	+2,307	—	—	—	+2,307	+2,307
1905–06	15,747	17,879	–2,132	19,457	19,298	+ 159	—	—	—	–1,973	– 987
1906–07	19,942	19,493	+ 449	22,473	20,076	+2,397	22,467	20,605	+1,862	+4,708	+1,569
1907–08	16,512	18,856	–2,344	19,851	20,146	– 295	18,640	21,053	–2,413	–5,052	–1,684
1908–09	19,698	19,397	+ 301	22,391	20,834	+1,557	22,271	22,387	– 116	+1,742	+ 581
1909–10	16,241	18,321	–2,080	19,409	20,535	–1,126	20,536	22,318	–1,782	–4,988	–1,663
1910–11	18,027	19,013	– 986	24,027	24,696	– 669	22,829	24,605	–1,776	–3,431	–1,144
1911–12	21,269	20,587	+ 682	27,560	25,390	+2,170	26,186	26,126	+ 60	+2,912	+ 971
1912–13	20,976	21,542	– 566	27,476	27,732	– 256	26,044	26,863	– 819	–1,641	– 547
1913–14	22,255	21,223	+1,032	29,303	27,966	+1,337	27,703	27,000	+ 703	+3,072	+1,024
Yearly Average	18,963	19,590	–627	23,258	22,500	+758	23,334	23,869	–535	–404	+427

COMPARISON OF MEAN TOTALS OF ALL ESTIMATES.

Season.	Mean Total Consumption.*	Mean Total Crops.†	Balance.	Mean Mill Consumption.‡	Mean Commercial Crops.§	Balance.	Mean Average Prices of American, Indian, and Egyptian.
1904–05	18,326	20,047	+1,721	17,726	19,648	+1,922	5·66
1905–06	18,589	17,820	– 769	18,214	17,266	– 948	6·73
1906–07	20,058	21,627	+1,569	19,523	20,815	+1,292	7·21
1907–08	20,019	18,334	–1,685	19,393	17,564	–1,829	6·68
1908–09	20,873	21,453	+ 580	19,828	20,229	+ 401	6·29
1909–10	20,391	18,729	–1,662	19,148	17,216	–1,932	9·10
1910–11	22,771	21,628	–1,143	20,222	18,854	–1,368	8·54
1911–12	24,034	25,005	+ 971	21,495	22,157	+ 662	7·09
1912–13	25,379	24,832	– 547	22,302	21,503	– 799	7·57
1913–14	25,396	26,420	+1,024	22,296	23,309	+1,013	7·52
			+ 59			–1,586	

TABLE B, III.—WORLD'S CONSUMPTION BY COUNTRIES, 1906–1913.

CALCULATED FROM THE INTERNATIONAL FEDERATION STATISTICS.

IN RUNNING BALES (000'S OMITTED).

Country	1906–07.		1907–08.		1908–09.		1909–10.		1910–11.		1911–12.		1912–13.	
	Spindles.	Bales.	Spindles.	Bales.	Spindles.	Bales.	Spindles.	Bales.	Spindles.	Bales.	Spindles.	Bales.	Spindles.	Bales.
Great Britain	50,680	4,069	52,818	3,842	53,312	3,513	53,397	3,389	54,523	3,842	55,317	4,274	55,653	4,274
Germany ..	9,339	1,688	9,883	2,106	10,163	1,765	10,200	1,689	10,480	1,732	10,726	1,797	11,186	1,700
Russia ..	6,500	1,517	7,855	1,964	7,800	1,837	8,234	2,182	8,672	2,310	8,800	2,806	9,213	2,508
France ..	6,800	951	6,731	950	7,000	974	7,100	948	7,300	971	7,400	1,022	7,400	1,010
Austria ..	3,616	706	4,026	740	4,352	803	4,643	820	4,564	785	4,798	864	4,909	837
Italy ..	3,500	893	4,181	1,027	4,000	941	4,200	808	4,582	984	4,580	1,027	4,600	790
Spain ..	1,850	341	1,850	343	1,900	327	1,853	276	1,853	332	2,200	375	2,000	358
Switzerland..	1,484	94	1,493	95	1,497	97	1,497	90	1,481	89	1,408	92	1,398	98
Belgium ..	1,140	196	1,162	212	1,231	210	1,322	198	1,327	237	1,388	234	1,492	257
Sweden ..	415	97	390	88	450	85	470	98	528	108	530	110	534	114
Portugal ..	420	102	450	81	451	62	476	58	476	75	480	69	480	79
Holland ..	396	74	396	77	425	86	426	78	431	83	454	85	479	85
Denmark ..	59	25	78	21	78	23	83	20	80	22	84	25	90	25
Norway ..	72	12	75	11	76	11	74	11	74	11	74	11	75	11
U.S.A. ..	26,242	4,987	27,846	4,575	27,783	5,085	28,349	4,707	28,872	4,696	30,313	5,368	31,505	5,786
India ..	*5,280	*2,115	5,500	2,195	5,800	2,246	5,657	2,038	6,250	2,200	6,195	2,254	6,084	2,177
Japan ..	1,483	1,168	1,637	1,024	1,732	1,059	1,948	1,334	2,131	1,528	2,192	1,451	2,300	1,589
Canada ..	*800	*125	795	115	855	125	855	128	855	119	855	127	855	113
Others ..	99	38	1,757	708	2,600	1,209	2,600	915	2,800	1,012	2,900	1,202	3,200	1,121
Total ..	120,176	19,198	128,959	20,174	201,705	20,458	133,384	19,787	137,279	21,136	140,694	22,693	143,443	22,932

* From the U.S.A. Census Bureau Returns (*Supply and Distribution of Cotton*, 1907).

TABLE B, IV.—WORLD'S CONSUMPTION BY COUNTRIES AND VARIETIES, 1912–13.*

In Running Bales (000's omitted).

Country.	Actual Returns.							Estimated Totals.						
	Spindles.	American.	Indian.	Egyptian.	Sundries.	Total.	Per 1,000 Spindles.	Spindles.	Addition %.	American.	Indian.	Egyptian.	Sundries.	Total.
Great Britain	49,806	3,282	48	351	144	3,825	77	55,653	11·7	3,667	54	392	161	4,274
Germany ..	10,394	1,259	175	102	44	1,580	152	11,186	7·7	1,355	188	110	47	1,700
Russia ..	7,131	377	16	67	1,482	1,942	272	9,213	29·1	487	21	87	1,913	2,508
France ..	7,229	788	93	78	28	987	136	7,400	2·4	806	95	80	29	1,010
Austria ..	4,909	627	154	33	23	837	171	4,909	—	627	154	33	23	837
Italy ..	4,332	538	165	18	24	744	172	4,600	6·2	571	175	19	25	790
Spain ..	1,835	262	31	19	18	329	179	2,000	9·0	285	34	20	19	358
Switzerland	1,268	59	3	26	1	89	70	1,398	10·0	65	3	29	1	98
Belgium ..	1,492	171	82	1	3	257	172	1,492	—	171	82	1	3	257
Sweden ..	382	78	3	—	1	82	216	534	38·7	108	4	—	2	114
Portugal ..	450	59	1	1	13	74	164	480	6·6	63	1	1	14	79
Holland ..	479	68	11	—	6	85	177	479	—	68	11	—	6	85
Denmark ..	90	25	—	—	1	26	285	90	—	24	—	—	1	25
Norway ..	75	9	1	—	1	11	154	75	—	9	1	—	1	11
U.S.A. ..	31,505	5,553	—	201	32	5,786	184	31,505	—	5,533	—	201	32	5,786
India ..	4,745	74	1,622	1	1	1,698	358	6,084	28·2	94	2,081	1	1	2,177
Japan ..	2,289	423	988	16	154	1,581	691	2,300	0·5	425	993	16	155	1,589
Canada ..	812	108	—	1	—	108	133	855	5·2	113	—	—	—	113
Others ..	674	3	—	3	230	236	351	3,200	375·0	16	—	14	1,091	1,121
Total ..	129,896	13,760	3,394	917	2,206	20,277	156	143,453	—	14,507	3,899	1,004	3,523	22,932

* From the International Federation's statistics.

SECTION C.—AMERICA.

TABLE C, I.—HISTORY OF THE AMERICAN COTTON CROP, 1790–1914.

Year.	Running Bales (S.D.C.).	Average net Weight.	Equivalent 500-lb. Bales	Exports 500-lb. Bales.
1790 ..	6,667	225	3,138	379
1791 ..	8,889	225	4,184	277
1792 ..	13,333	225	6,276	1,097
1793 ..	22,222	225	10,460	3,565
1794 ..	35,556	225	16,736	9,414
1795 ..	35,556	225	16,736	12,213
1796 ..	44,444	225	20,921	7,577
1797 ..	48,889	225	23,013	18,720
1798 ..	66,667	225	31,381	19,065
1799 ..	88,889	225	41,841	35,580
1800 ..	153,509	228	73,222	41,822
1801 ..	210,526	228	100,418	47,768
1802 ..	231,092	238	115,063	75,424
1803 ..	222,222	270	125,523	70,068
1804 ..	261,044	249	135,983	76,780
1805 ..	304,348	230	146,444	71,315
1806 ..	285,714	280	167,364	127,889
1807 ..	289,855	276	167,364	21,261
1808 ..	334,821	224	156,904	101,981
1809 ..	328,000	250	171,548	186,523
1810 ..	286,195	297	177,824	124,116
1811 ..	325,203	246	167,364	57,775
1812 ..	304,878	246	156,904	38,220
1813 ..	304,878	246	156,904	35,458
1814 ..	254,545	275	146,444	165,997
1815 ..	369,004	271	209,205	163,894
1816 ..	439,716	282	259,414	171,299
1817 ..	465,950	279	271,967	184,942
1818 ..	446,429	280	261,506	175,994
1819 ..	632,576	264	349,372	255,720
1820 ..	575,540	278	334,728	249,787

TABLE C, I.—HISTORY OF THE AMERICAN CROP—*Continued.*

(000'S OMITTED.)

Year.	Running Bales (S.D.C.).	Average net Weight.	Equivalent 500-lb. Bales.	Exports 500-lb. Bales.	Liverpool Crop Figures (L.C.A.).
1821	636	283	377	289	370
1822	705	298	439	347	539
1823	656	282	387	287	588
1824	752	286	450	353	509
1825	817	312	533	469	569
1826	1,057	331	732	589	720
1827	806	335	565	421	957
1828	953	341	680	530	721
1829	1,077	339	764	597	858
1830	1,026	341	732	554	977
1831	1,069	360	805	644	1,039
1832	1,114	350	816	649	987
1833	1,226	363	931	769	1,070
1834	1,253	367	962	775	1,200
1835	1,361	373	1,062	847	1,254
1836	1,424	379	1,129	888	1,361
1837	1,801	379	1,428	1,192	1,425
1838	1,361	384	1,093	827	1,805
1839	2,064	383	1,654	1,488	1,363
1840	1,635	394	1,348	1,060	2,182
1841	1,684	397	1,398	1,169	1,639
1842	2,379	409	2,035	1,585	1,689
1843	2,030	412	1,750	1,327	2,394
1844	2,395	415	2,079	1,746	2,109
1845	2,101	411	1,806	1,095	2,485
1846	1,779	431	1,604	1,054	2,171
1847	2,440	417	2,128	1,629	1,860
1848	2,867	436	2,615	2,053	2,424
1849	2,469	429	1,975	1,271	2,809
1850	2,454	416	2,136	1,854	2,172
1851	3,126	428	2,799	2,186	2,415
1852	3,416	438	3,130	2,223	3,090
1853	3,075	430	2,766	1,976	3,353
1854	2,983	434	2,708	2,017	3,035
1855	3,666	420	3,221	2,703	2,932
1856	3,094	444	2,874	2,097	3,645
1857	3,257	442	3,012	2,237	3,057
1858	4,019	447	3,758	2,773	3,239
1859	5,387	461	4,310	3,535	3,994
1860	3,849	477	3,841	615	4,824
1861	4,500	477	4,491	10	3,826
1862	1,600	477	1,597	23	No records
1863	450	477	449	24	during
1864	300	447	299	18	war.
1865	2,269	441	2,094	1,301	2,314
1866	2,097	444	1,948	1,402	2,204
1867	2,520	445	2,346	1,503	2,499

TABLE C, I.—HISTORY OF THE AMERICAN CROP—*Continued.*

(000's OMITTED.)

Year.	Running Bales (S.D.C.).	Average net Weight.	Equivalent 500-lb. Bales.	Exports 500-lb. Bales.	Liverpool Crop Figures (L.C.A.).
1868	2,366	444	2,198	1,300	2,439
1869	3,012	440	2,410	1,988	3,155
1870	4,352	442	4,025	2,923	4,352
1871	2,974	443	2,757	1,825	2,974
1872	3,931	444	3,651	2,471	3,931
1873	4,170	444	3,874	2,683	4,170
1874	3,833	440	3,528	2,504	3,833
1875	4,632	444	4,303	3,038	4,669
1876	4,474	440	4,118	2,839	4,485
1877	4,774	450	4,494	3,197	4,811
1878	5,074	447	4,745	3,290	5,074
1879	5,755	454	5,466	3,743	5,757
1880	6,606	460	6,357	4,453	6,589
1881	5,456	450	5,136	3,377	5,436
1882	6,950	470	6,833	4,591	6,992
1883	5,713	462	5,522	3,733	5,714
1884	5,682	460	5,477	3,783	5,669
1885	6,576	463	6,369	4,201	6,550
1886	6,505	464	6,315	4,302	6,514
1887	7,047	467	6,885	4,519	7,018
1888	6,938	477	6,924	4,730	6,935
1889	7,473	478	7,473	4,929	7,314
1890	8,653	473	8,562	5,850	8,656
1891	9,035	473	8,941	5,897	9,039
1892	6,700	475	6,658	4,485	6,717
1893	7,493	474	7,433	5,307	7,527
1894	9,901	484	10,026	6,961	9,893
1895	7,161	477	7,147	4,762	7,162
1896	8,533	477	8,516	6,124	8,714
1897	10,898	482	10,985	7,811	11,181
1898	11,189	489	11,435	7,627	11,235
1899	9,393*	476	9,345*	6,168	9,440
1900	10,102	480	10,123	6,807	10,425
1901	9,583	489	9,510	6,870	10,701
1902	10,588	481	10,631	6,914	10,758
1903	9,820	480	9,851	6,234	10,124
1904	13,451	478	13,438	9,057	13,557
1905	10,495	482	10,575	6,975	11,320
1906	12,983	489	13,274	8,825	13,551
1907	11,058	480	11,107	7,780	11,582
1908	13,086	484	13,242	8,890	13,829
1909	10,073	475	10,005	6,492	10,651
1910	11,568	480	11,609	8,026	12,132
1911	15,553	483	15,693	10,681	16,043
1912	13,489	486	13,703	9,199	14,129
1913	13,983	484	14,156	9,256	14,610

* Excluding linters from 1899 onwards. For inclusive figures, see Table C, III.

TABLE C, II.—AMERICAN

500-POUND BALES

Destination.	1904–05.	1905–06.	1906–07.	1907–08.
United Kingdom ..	3,967	3,181	3,966	2,956
Percentage of Total	46·2	43·8	43·9	38·7
Germany	2,012	1,872	2,316	2,386
	23·4	25·7	25·6	31·3
France	818	818	1,007	889
	9·5	11·3	11·1	11·6
Italy	535	487	568	419
	6·2	6·7	6·3	5·5
Spain	296	242	276	263
	3·4	3·3	3·1	3·4
Belgium	146	115	154	119
	1·7	1·6	1·7	1·6
Russia	129	112	121	98
	1·5	1·5	1·3	1·3
Austria-Hungary ..	63	56	114	90
	0·7	0·8	1·3	1·2
Netherlands	31	18	29	28
	0·4	0·2	0·3	0·4
Rest of Europe	71	44	64	62
	0·8	0·6	0·7	0·8
Total Continental..	4,101	3,764	4,649	4,354
	47·6	51·7	51·4	57·1
Japan	337	147	262	200
	3·9	2·0	2·9	2·6
Canada	116	142	150	114
	1·3	2·0	1·6	1·4
Mexico	79	29	1	5
	0·9	0·4	0·1	0·1
All Other Countries ..	9	5	8	5
	0·1	0·1	0·1	0·1
Total Exports ..	8,609	7,268	9,036	7,634
Total Crop	13,697	10,726	13,305	11,326
Percentage exported	62·8	67·8	67·9	67·4

* From "Supply and

EXPORTS, 1904–1914.*

(000's omitted).

1908–09.	1909–10.	1910–11.	1911–12.	1912–13.	1913–14.
3,665 41·3	2,444 38·2	3,461 42·9	4,343 39·4	3,717 40·7	3,582 37·7
2,438 27·4	1,888 29·4	2,203 27·3	3,156 28·5	2,444 26·7	2,884 30·2
1,098 12·3	968 15·0	1,022 12·7	1,228 11·1	1,075 11·8	1,139 12·0
566 6·4	393 6·1	436 5·4	636 5·7	501 5·5	537 5·6
302 3·4	178 2·8	242 3·0	314 2·8	318 3·5	297 3·1
158 1·8	102 1·5	150 1·8	212 1·9	227 2·5	227 2·4
97 1·1	67 1·0	85 1·0	112 1·0	75 0·8	99 1·0
95 1·1	57 0·9	80 0·9	126 1·1	113 1·2	107 1·1
30 0·3	19 0·3	18 0·2	35 0·3	15 0·2	35 0·4
57 0·6	44 0·7	48 0·6	83 0·7	54 0·6	65 0·7
4,841 54·4	3,716 57·7	4,284 52·9	5,902 53·1	4,822 52·8	5,390 56·5
209 2·3	95 1·5	157 2·0	481 4·4	397 4·4	353 3·7
131 1·5	126 2·0	157 2·0	182 1·6	152 1·7	151 1·6
43 0·4	30 0·5	5 0·1	16 0·2	21 0·2	35 0·4
7 0·1	2 0·1	4 0·1	146 1·3	15 0·2	11 0·1
8,896	6,413	8,068	11,070	9,124	9,522
13,432 66·2	10,386 62·0	11,966 67·4	16,109 68·7	14,091 64·7	14,614 65·1

Distribution of Cotton," 1914.

TABLE C, III.—AMERICAN CROP, VARIOUS ESTIMATES, 1899–1914.

(000's omitted.)

Year.	Liverpool Cotton Association, Jones' Handbook, etc.*	Shepperson's Cotton Facts.	U.S.A. Census Bureau (Cotton Production). Running Bales (Counting Round as Half Bales).			U.S.A. Census Bureau (Cotton Production). Equivalent 500-lb. Bale (Gross).	Year-Book of the U.S.A. Department of Agriculture.
	Running Bales.	Running Bales.	Cotton.	Linters.	Total.	Linters included.	Bales of 478 lb. net, excluding Linters.
1899 ..	9,440	9,422	9,393	115	9,508	9,460	9,345
1900 ..	10,425	10,339	10,102	144	10,246	10,267	10,139
1901 ..	10,701	10,768	9,583	166	9,749	9,676	9,510
1902 ..	10,758	10,674	10,588	196	10,784	10,827	10,631
1903 ..	10,124	10,002	9,820	196	10,016	10,046	9,851
1904 ..	13,557	13,654	13,451	246	13,697	13,680	13,438
1905 ..	11,320	11,234	10,495	231	10,726	10,805	10,575
1906 ..	13,551	13,540	12,983	322	13,305	13,595	13,274
1907 ..	11,582	11,441	11,058	268	11,326	11,375	11,107
1908 ..	13,829	13,817	13,086	346	13,432	13,587	13,242
1909 ..	10,651	10,513	10,073	313	10,386	10,315	10,005
1910 ..	12,132	12,075	11,568	398	11,966	12,006	11,609
1911 ..	16,043	16,101	15,553	556	16,109	16,250	15,693
1912 ..	14,129	14,104	13,489	602	14,091	14,313	13,703
1913 ..	14,610	14,552	13,983	631	14,614	14,795	14,156
1914 ..							

* From the *Commercial and Financial Chronicle*, New York.

SECTION D.—INDIA.

TABLE D, I.—INDIAN CROP, VARIOUS ESTIMATES, 1898–1914.

(000's omitted.)

Season.	Commercial Intelligence Department.		Turner Routledge's Diagram.	Jones' Handbook.	U.S.A. Census Bureau. Cotton Production, 1913.	
	Out-turn.	Net Exports and Consumption.				
	Bales of 400 lbs.		Bales of 400 lbs.		500-lb. Bales	= 400 lbs.
1898–99	3,015	3,408	3,477	3,477	2,512	3,140
1899–1900	1,090	2,106	2,613	3,099	1,675	2,094
1900–01	2,953	3,133	3,300	3,377	2,163	2,704
1901–02	2,745	3,566	3,796	4,122	2,649	3,311
1902–03	3,367	4,050	3,855	4,183	3,000	3,750
1903–04	3,161	3,789	4,141	4,471	2,864	3,580
1904–05	3,791	3,944	4,061	4,061	3,061	3,826
1905–06	3,416	4,168	4,797	4,797	3,390	4,237
1906–07	4,934	4,855	5,195	5,197	3,926	4,907
1907–08	3,122	3,782	4,303	4,445	2,498	3,122
1908–09	3,692	4,200	4,779	4,779	2,953	3,692
1909–10	4,718	4,928	5,317	5,317	3,774	4,718
1910–11	3,853	4,303	4,587	4,587	3,082	3,853
1911–12	3,288	4,004	4,178	4,178	2,630	3,288
1912–13	4,395	4,326	4,385	4,692	3,688	4,610
1913–14	—	—	5,201	5,987	4,161	5,201

TABLE D, II.—INDIAN EXPORTS, 1903-1913* (IN HUNDREDWEIGHTS—000's OMITTED).

Destination.	1903-04.	1904-05.	1905-06.	1906-07.	1907-08.	1908-09.	1909-10.	1910-11.	1911-12.	1912-13.
United Kingdom ..	652	347	373	452	453	383	541	580	418	306
Percentage of total	8·2	6·1	5·0	6·1	5·2	5·6	6·0	6·6	5·7	4·1
France	560	235	482	560	625	456	499	499	292	328
	7·0	4·1	6·5	7·5	7·2	6·7	5·5	5·7	3·9	4·4
Spain	265	127	140	139	157	107	115	210	128	87
	3·3	2·2	1·8	1·8	1·8	1·5	1·2	2·4	1·7	1·1
Germany	1,568	1,025	1,384	1,663	1,880	1,137	1,327	1,394	891	950
	19·7	18·1	18·7	22·4	21·9	16·7	14·8	16·0	12·1	12·8
Belgium	1,089	668	1,128	1,102	1,254	956	1,075	1,094	774	864
	13·7	11·8	15·2	14·8	14·6	14·0	12·0	12·5	10·5	11·7
Austria	705	456	615	619	622	380	694	686	472	396
	8·8	8·0	8·3	8·3	7·2	5·5	7·7	7·8	6·4	5·3
Italy	1,001	627	809	874	1,061	851	936	1,096	680	584
	12·6	11·0	10·9	11·8	12·3	12·5	10·4	12·6	9·2	7·9
Rest of Europe ..	195	30	25	59	93	41	61	55	16	30
	2·8	0·7	0·5	1·1	1·4	0·8	1·0	0·9	0·5	0·6
Total Continental	5,383	3,168	4,583	5,016	5,692	3,928	4,707	5,034	3,253	3,239
	67·8	55·9	61·9	6·77	66·4	67·7	52·6	57·9	44·3	43·8
China	165	171	185	166	135	216	347	146	90	197
	2·0	3·0	2·5	2·2	1·5	3·2	3·8	1·6	1·2	2·6
Japan	1,680	1,951	2,231	1,729	2,245	2,223	3,297	2,852	5,515	3,592
	21·2	34·4	30·2	23·3	26·2	32·7	36·8	33·0	47·9	48·6
Others	51	[illegible]	28	38	37	48	76	74	53	44
	0·8	0·6	0·4	0·7	0·7	0·8	0·8	0·9	0·9	0·9
Total	7,931	5,658	7,400	7,401	8,562	6,798	8,968	8,686	7,329	7,378
In 400-lb. bales ..	2,220	1,584	2,072	2,072	2,397	1,903	2,504	2,432	2,052	2,065
Total crop ..	3,789	3,944	4,168	4,855	3,782	4,200	4,928	4,303	4,004	4,326
Percentage exported	58·6	40·2	49·6	42·7	63·4	45·3	50·8	56·5	51·2	47·7

* From the "Annual Statement of Trade of British India."

SECTION E.—EGYPT.

TABLE E, I.—HISTORY OF THE EGYPTIAN CROP, 1821-1914

(000's omitted.)

Year.	Crop. Kantars. (A.S.E., 1910).	Year.	Crop. Kantars (A.S.E., 1910).	Crop. Bales (Jones' Handbook).	Year.	Crop. Kantars (A.S.E., 1914).	Crop. Bales (Jones).
1821	0·9	1853	477		1885	2,792	405
1822	35	1854	478		1886	2,872	418
1823	218	1855	521		1887	2,996	416
1824	228	1856	540		1888	2,723	386
1825	159	1857	491		1889	3,238	431
1826	216	1858	520		1890	4,159	545
1827	160	1859	503		1891	4,765	625
1828	59	1860	501		1892	5,221	684
1829	105	1861	596	American Civil War.	1893	5,033	707
1830	214	1862	721		1894	4,619	610
1831	187	1863	1,182		1895	5,276	695
1832	136	1864	1,719		1896	5,879	778
1833	56	1865	2,140		1897	6,544	919
1834	144	1866	865		1898	5,588	730
1835	214	1867	1,128		1899	6,510	855
1836	243	1868	1,207		1900	5,435	711
1837	315	1869	1,303		1901	6,370	864
1838	239	1870	1,363		1902	5,839	768
1839	134	1871	1,971		1903	6,509	797
1840	159	1872	2,044		1904	6,313	843
1841	194	1873	2,299		1905	5,960	793
1842	211	1874	2,538		1906	6,949	923
1843	261	1875	2,107		1907	7,235	908
1844	153	1876	2,928	443	1908	6,751	898
1845	345	1877	2,773	408	1909	5,001	673
1846	202	1878	2,594	254	1910	7,574	984
1847	257	1879	1,686	469	1911	7,424	965
1848	120	1880	3,199	407	1912	7,533	969
1849	258	1881	2,776	426	1913	7,684	966
1850	365	1882	2,912	328	1914	*6,500* (Estimate)	—
1851	384	1883	2,284	384			
1852	670	1884	2,694	500			

TABLE E, II.—WEEKLY ARRIVALS OF COTTON AT ALEXANDRIA, 1907-1915.*

IN KANTARS (000's OMITTED).

Seasons.		1907–08.			1908–09.			1909–10.			1910–11.		
Week.	Month.	Date.	Week.	Total.	Date.	Week.	Total.	Date.	Week.	Total.	Date.	Week.	Total.
1st	September	5	11	11	4	2	2	3	1	1	2	2	2
..	,,	12	27	38	11	6	7	10	10	11	9	15	17
..	,,	19	64	102	18	17	24	17	37	48	16	46	64
..	,,	26	117	219	25	40	65	24	69	117	23	94	158
5th	October ..	3	195	414	2	79	144	1	141	258	30	182	340
..	,,	10	313	727	9	117	261	8	204	462	7	251	591
..	,,	17	324	1,051	16	189	450	14	243	705	14	289	880
..	,,	24	372	1,424	23	264	714	22	249	954	21	402	1,282
..	,,	31	408	1,832	30	257	971	29	347	1,301	28	509	1,791
10th	November	7	287	2,119	6	324	1,295	5	393	1,694	4	491	2,282
..	,,	14	411	2,530	13	370	1,665	12	361	2,054	11	479	2,762
..	,,	21	372	2,902	20	418	2,083	19	352	2,407	18	472	3,233
..	,,	28	368	3,271	27	422	2,505	26	392	2,799	25	453	3,686
..	December	5	365	3,635	4	414	2,919	3	365	3,163	2	454	4,140
15th	,,	12	358	3,993	11	396	3,315	10	314	3,477	9	432	4,572
..	,,	19	374	4,366	18	348	3,663	17	303	3,780	16	288	4,860
..	,,	26	308	4,674	24	287	3,950	22	181	3,961	23	292	5,151
..	January	2	286	4,961	31	290	4,240	31	154	4,115	30	320	5,471
..	,,	9	252	5,212	8	222	4,462	6	138	4,252	6	321	5,792
20th	,,	16	176	5,389	15	249	4,711	13	112	4,364	13	266	6,058
..	,,	23	98	5,487	22	221	4,932	21	120	4,484	20	215	6,273
..	,,	30	104	5,591	29	247	5,179	28	79	4,564	27	174	6,447

..	February	6	131	5,721	5	259	5,438	4	59	4,623	3	163	6,610
..	,,	13	148	5,869	12	158	5,596	11	46	4,669	10	146	6,756
25th	,,	20	151	6,020	19	183	5,779	18	48	4,717	17	98	6,855
..	,,	27	186	6,207	26	163	5,942	25	35	4,753	24	78	6,933
..	March ..	6	144	6,351	5	151	6,093	4	24	4,777	3	113	2,046
..	,, ..	13	86	6,437	12	146	6,239	11	26	4,803	10	79	7,125
..	,, ..	20	110	6,547	19	98	6,336	18	23	4,826	17	58	7,182
30th	,, ..	27	85	6,632	26	67	6,403	25	10	4,836	24	90	7,273
..	April ..	3	89	6,721	2	65	6,468	1	8	4,845	31	55	7,328
..	,, ..	10	80	6,800	8	26	6,494	8	9	4,854	7	54	7,382
..	,, ..	17	52	6,852	16	23	6,517	15	6	4,860	13	35	7,416
..	,, ..	24	48	6,900	23	19	6,536	22	5	4,865	20	28	7,444
35th	May ..	1	39	6,939	30	23	6,559	28	3	4,868	28	22	7,466
..	,, ..	8	29	6,969	7	29	6,588	6	8	4,876	5	9	7,475
..	,, ..	15	27	6,996	14	18	6,606	13	3	4,878	12	15	7,490
..	,, ..	22	17	7,013	21	20	6,626	19	4	4,882	19	15	7,505
..	,, ..	29	25	7,038	28	13	6,639	27	7	4,889	26	13	7,518
40th	June ..	5	26	7,063	4	10	6,649	3	5	4,894	2	18	7,358
..	,, ..	12	25	7,088	11	8	6,657	10	4	4,898	9	10	7,546
..	,, ..	19	23	7,111	18	5	6,662	17	4	4,901	16	6	7,552
..	,, ..	26	17	7,128	25	1	6,664	24	2	4,903	23	6	7,559
..	July ..	3	11	7,139	2	3	6,667	1	3	4,906	30	6	7,565
45th	,, ..	10	9	7,148	9	5	6,672	8	1	4,907	7	5	7,570
..	,, ..	17	7	7,155	16	—	6,673	15	1	4,909	14	3	7,575
..	,, ..	24	3	7,158	23	1	6,673	22	1	4,909	21	2	7,576
..	,, ..	31	1	7,159	30	1	6,674	29	—	4,910	28	3	7,579
..	August ..	7	5	7,164	6	1	6,676	5	—	4,910	4	—	7,579
50th	,, ..	14	5	7,169	13	—	6,676	12	—	4,910	11	—	7,579
..	,, ..	21	2	7,171	20	1	6,677	19	1	4,910	18	—	7,579
..	,, ..	28	1	7,172	27	2	6,678	26	1	4,912	25	—	7,579

* From the Weekly Bulletin of the Alexandria General Produce Association.

TABLE E, II.—WEEKLY ARRIVALS OF COTTON AT ALEXANDRIA, 1907-1915 *—*Continued.*

IN KANTARS (000's OMITTED).

Seasons.		1911–12.			1912–13.			1913–14.			1914–15.		
Week.	Month.	Date.	Week.	Total.	Date.	Week.	Total.	Date.	Week.	Total.	Date.	Week.	Total.
1st	September	1	1	1	6	22	22	5	23	23	4	—	—
..	,,	8	6	6	11	26	48	12	63	86	11	1	1
..	,,	15	25	31	20	71	119	19	146	233	18	3	4
..	,,	22	42	74	27	144	263	26	242	475	25	3	7
5th	,,	29	52	125	4	237	501	3	355	830	2	10	17
..	October	6	102	227	11	344	845	10	425	1,255	9	52	69
..	,,	13	171	398	18	430	1,275	17	478	1,733	16	101	170
..	,,	20	227	625	25	485	1,760	24	474	2,207	23	143	313
..	,,	27	294	919	1	477	2,237	31	508	2,715	29	147	461
10th	November	3	365	1,283	8	487	2,724	7	487	3,202	9	175	637
..	,,	10	383	1,667	15	497	3,222	14	369	3,571	13	275	911
..	,,	17	332	1,998	22	465	3,687	21	380	3,951	20	280	1,192
..	,,	24	409	2,407	29	322	4,009	28	345	4,296	27	335	1,527
..	,,	30	389	2,797	6	435	4,444	5	393	4,689	4	307	1,834
15th	December	8	337	3,134	13	429	4,873	12	349	5,038	11	327	2,160
..	,,	15	412	3,546	20	406	5,279	19	308	5,346	18	350	2,510
..	,,	21	340	3,887	27	394	5,673	24	151	5,497	24	285	2,795
..	,,	29	332	4,219	3	300	5,973	2	288	5,785	31	371	3,165
..	January	5	359	4,578	10	256	6,229	9	222	6,008	8	354	3,519
20th	,,	12	305	4,883	17	225	6,454	16	183	6,191	15	263	3,782
..	,,	19	290	5,172	24	173	6,627	23	157	6,348	22	241	4,023
..	,,	26	320	5,492	31	171	6,798	30	171	6,519	29	296	4,319

..	February	2	307	5,799	7	133	6,931	6	132	6,651	5	229	4,548
..	,,	9	227	6,026	14	85	7,016	13	104	6,755	12	228	4,776
25th	,,	16	238	6,265	22	69	7,084	20	158	6,913	19	249	5,025
..	,,	23	168	6,432	1	76	7,160	27	100	7,013	26	212	5,237
..	March ..	1	155	6,587	7	62	7,222	6	104	7,117			
..	,, ..	8	139	6,726	14	46	7,268	13	95	7,212			
..	,, ..	15	115	6,840	22	26	7,294	20	65	7,277			
30th	,, ..	22	73	6,914	29	30	7,324	27	52	7,329			
..	,, ..	29	103	7,017	5	29	7,353	3	52	7,380			
..	April ..	4	45	7,062	12	21	7,375	9	43	7,423			
..	,, ..	12	37	7,099	19	14	7,389	16	35	7,458			
..	,, ..	19	28	7,127	26	8	7,397	24	30	7,488			
35th	,, ..	26	29	7,156	3	11	7,408	1	30	7,518			
..	May ..	3	25	7,181	10	11	7,419	8	18	7,536			
..	,, ..	10	13	7,194	17	8	7,427	15	11	7,547			
..	,, ..	17	15	7,209	24	5	7,433	22	15	7,562			
..	,, ..	24	14	7,223	31	6	7,438	29	5	7,567			
40th	,, ..	31	8	7,231	7	6	7,444	5	10	7,577			
..	June ..	7	7	7,238	14	2	7,446	12	5	7,582			
..	,, ..	14	6	7,244	21	5	7,451	19	7	7,589			
..	,, ..	21	6	7,250	28	1	7,452	26	11	7,600			
..	,, ..	28	2	7,252	5	1	7,453	3	3	7,603			
45th	July ..	5	2	7,253	12	2	7,455	10	4	7,607			
..	,, ..	12	3	7,256	19	1	7,455	17	2	7,609			
..	,, ..	19	1	7,257	26	1	7,456	24	1	7,610			
..	,, ..	26	1	7,258	2	1	7,457	31	—	7,611			
..	August ..	2	—	7,258	9	1	7,458	7	2	7,612			
50th	,, ..	9	—	7,258	16	—	7,458	14	—	7,612			
..	,, ..	16	1	7,259	23	2	7,460	21	—	7,612			
..	,, ..	23	4	7,263	30	14	7,474	28	—	7,612			
..	,, ..	30	10	7,273	—								

* From the Weekly Bulletin of the Alexandria General Produce Association.

TABLE E, III.—EGYPTIAN COTTON AREA, BY PROVINCES, 1905-1914.

IN FEDDANS. (From the "Annuaire Statistique de l'Égypte," 1914.)

Province.	1905.	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.	1914.
Lower Egypt:										
Beheira ..	255,488	258,707	263,581	267,636	250,376	240,625	245,877	242,862	244,717	253,206
Gharbia ..	385,965	387,925	403,087	399,345	428,778	423,410	428,154	433,410	423,636	432,674
Daqahlia ..	229,746	234,561	241,282	251,438	249,035	266,054	265,679	261,414	257,850	264,599
Sharqia ..	200,855	199,318	199,729	197,696	206,141	206,761	215,544	217,721	218,161	223,157
Qaliubia ..	62,592	60,311	60,863	61,148	61,863	61,771	65,369	64,880	70,681	72,387
Menufia ..	121,204	119,275	120,692	121,638	130,395	127,213	126,900	125,949	124,520	127,220
Governorates	50	10	34	—	—	—	13	18	44	—
Total ..	1,255,900	1,260,107	1,289,268	1,298,901	1,326,588	1,325,834	1,347,536	1,346,254	1,339,609	1,373,243
Upper Egypt:										
Giza ..	20,176	17,443	17,835	21,862	20,129	28,246	43,463	44,958	41,692	41,883
Fayum ..	76,348	76,561	85,780	89,365	77,061	80,527	73,357	80,511	82,341	79,149
Beni Suef ..	48,517	42,950	66,928	81,940	57,053	66,997	78,853	75,567	77,406	74,755
Minia ..	131,756	87,295	116,271	116,346	92,320	106,655	118,847	120,734	120,390	115,856
Assiut ..	29,006	18,988	25,639	29,373	21,672	31,190	42,724	47,114	52,575	58,599
Girga ..	451	145	90	253	231	550	1,752	2,751	4,582	6,915
Qena ..	3,879	2,616	1,303	2,375	1,786	2,541	3,938	3,587	4,144	3,954
Assuan ..	569	186	110	—	215	70	771	339	355	936
Total ..	310,702	246,184	313,956	341,514	270,467	316,776	363,705	375,561	383,485	382,027

TABLE E, IV.—EXPORTS OF EGYPTIAN COTTON, BY COUNTRIES, 1880–1913.*

IN KANTARS (000'S OMITTED).

Years.	Total Exports.	Destination (with Percentages).								
		England.	Germany.	America.	Austria-Hungary.	France.	Italy.	Russia.	Switzerland.	Others.
1880–84†	2,791	1,855	—	3	156	224	176	314	—	63
	—	66·47	—	0·12	5·60	8·01	6·31	11·24	—	2·25
1885–89†	3,039	1,859	2	3	267	242	200	406	1	63
	—	61·16	0·06	0·01	8·78	7·95	6·58	13·36	0·05	2·05
1890–94†	4,512	2,437	114	82	278	280	268	856	50	148
	—	54·00	2·53	1·81	6·16	6·21	5·93	18·97	1·11	3·28
1895–99†	5,765	2,832	254	321	259	455	215	913	263	263
	—	49·12	4·40	5·56	4·50	7·89	3·73	15·85	4·39	4·56
1900–04†	5,941	2,932	455	297	266	492	273	608	277	341
	—	49·36	7·66	5·00	4·48	8·28	4·59	10·23	4·55	5·85
1905	6,527	3,292	559	502	317	576	244	419	314	304
	—	50·44	8·57	7·69	4·85	8·83	3·74	6·42	4·80	4·66
1906	6,697	3,513	536	484	345	586	242	444	260	288
	—	52·46	8·00	7·23	5·15	8·75	3·60	6·63	3·88	4·30
1907	6,859	3,583	556	594	331	522	223	455	285	311
	—	52·24	8·10	8·66	4·82	7·61	3·26	6·64	4·15	4·52
1908	6,348	3,124	561	419	310	537	253	511	261	372
	—	49·21	8·83	6·61	4·89	8·46	3·99	8·04	4·11	5·86
1909	6,952	3,407	623	599	353	642	230	484	266	349
	—	49·01	8·96	8·61	5·07	9·23	3·31	6·96	3·83	5·02
1910	6,009	3,034	554	467	298	536	191	396	226	307
	—	50·49	9·23	7·78	4·97	8·90	3·18	6·59	3·76	5·10
1911	6,638	3,168	602	593	343	570	221	513	291	337
	—	47·72	9·08	8·94	5·17	8·58	3·33	7·72	4·39	5·07
1912	8,307	3,798	671	1,233	357	683	264	606	303	392
	—	45·72	8·08	14·84	4·30	8·22	3·18	7·29	3·65	4·72
1913	6,973	2,996	665	674	432	656	266	600	274	410
	—	42·97	9·54	9·66	6·20	9·41	3·82	8·60	3·93	5·87

NOTE ON SECTION F.

The most interesting point in the latter part of Table F, 1., is the comparison between cotton prices and those of other commodities since 1873, as shown by the movement of the Index Numbers. The effect may be briefly stated as follows: 1873 marked a high level of general prices, from which a severe and fairly steady fall took place till 1896, when the general index number was 88·2, against 151·9 in 1873. From this point the general level of prices has again risen, till in 1913 it was 116·5, or 32 per cent. above the lowest level of 1896.

The textile group followed a similar course. In 1873 it stood higher than the general index number (it was still more so in 1872), and it did the same in 1896; but it continued to fall when the general index number turned, till, in 1898, it reached 80·0, a much lower point than the general index number had ever touched. From this, again, it has risen distinctly faster than the general level, till, in 1913, it stood in about the same relation to the general index number as it did in 1872—*i.e.*, 135·0, against 116·5, as compared with 162·6 against 145·2.

But the index number for cotton alone shows a much more striking movement. It also was at its highest (162·6) in 1872, and in 1873 it stood only a little higher than the general index number, and well *below* that for the textile group. It fell faster than any until, in 1898, it stood at 68·9. From this, however, it immediately began to rise very fast, and now it stands higher than the general textile group, and has more than doubled its figure of sixteen years ago, while the general index number in the same period has only gained about 25 per cent., and the whole textile group only a little over 50 per cent. As cotton is by far the largest factor in the index number for the textile group, this means that the price of cotton has risen out of all proportion to other textiles, and still more so to the general level of prices. In other words, it supports the writer's contention that the rise in the price of cotton has been due primarily to the pressure of demand, and is quite out of proportion to the rise of prices in general, and even of the prices of other textile raw materials.

SECTION F.—PRICES.

TABLE F, I.—HISTORY OF COTTON PRICES.

Year.	American Price of Upland (cents per lb.).	Liverpool Prices (pence per lb.).		
		Middling American.	Fair Pernam.	Fair Surat.
1790	26·0	—	—	—
1791	29·0	—	—	—
1792	32·0	—	—	—
1793	33·0	—	—	—
1794	36·5	—	—	—
1795	36·5	—	—	—
1796	34·0	—	—	—
1797	39·0	—	—	—
1798	44·0	—	—	—
1799	28·0	—	—	—
1800	44·0	—	—	—
1801	19·0	18	32	16
1802	19·0	16	30	14
1803	20·0	12½	26½	11½
1804	23·0	14	26	11½
1805	22·0	16½	26½	14
1806	21·5	18¼	22	14½
1807	19·0	14½	21	13
1808	16·0	22	13	19¼
1809	16·0	20	25	18½
1810	15·5	15¼	22	15
1811	10·5	12½	19	12
1812	12·5	16¾	22	14
1813	15·5	23	27	17½
1814	21·0	29½	32½	21
1815	29·0	20¾	28	17
1816	26·0	18¼	26	15⅛
1817	34·0	20⅛	25	17
1818	24·0	20	25	15¾
1819	17·0	13½	18⅝	9⅝
1820	14·3	11½	15⅝	8⅛
1821	14·3	9½	12⅝	7⅞
1822	11·4	8¾	11⅛	6⅞
1823 *	14·7	8¼	12	6¼

* The first import of Egyptian to Liverpool was sold by auction on May 16, 1823, at 11d., American Middling being then 6¼d. to 8½d.—Ellison's "Cotton Trade of Great Britain," 1886, p. 88.

TABLE F, I.—HISTORY OF COTTON PRICES—*Continued.*

Year.		American Price of Upland (cents per lb.).	Liverpool Prices (pence per lb.).			
			Middling American.	Fair Pernam.	Fair Surat.	Egyptian (Extreme Prices).
						[Baines.]
1824	..	18·6	8½	11⅝	6⅝	9¼–12½
1825	..	12·2	11⅝	15⅛	8⅞	10¾–24
1826	..	9·3	6¾	10½	5½	6½–11
1827	..	10·3	6½	9⅜	5⅛	6¾–8½
1828	..	9·9	6⅜	8⅜	4⅝	6¾–9
1829	..	10·0	5¾	7¼	4	5⅞–8½
1830	..	9·7	6⅞	8¼	5	6½–10
1831	..	9·4	6	7¾	4⅝	7–9½
1832	..	12·3	6⅝	8 5/16	5	7–9¾
1833	..	12·9	8½	10⅜	6⅛	9½–10½
1834	..	17·4	8⅝	11⅞	6⅝	[illegible]–15
1835	..	16·5	10¼	13⅞	7¼	—
1836	..	13·2	9⅞	12¾	6¼	[Burn.]*
1837	..	10·1	7	10	4¾	9 –13
1838	..	13·4	7	9¼	4⅞	13½–16½
1839	..	8·9	7⅞	10	5⅞	11–12¼
1840	..	9·5	6	9	4½	9½–12
1841	..	7·8	6¼	8½	4⅝	6¾–10
1842	..	7·2	5⅜	7⅛	4	6¼–9
1843	..	7·7	4⅝	6⅛	3½	6–8
1844	..	5·6	4⅞	6⅛	3⅝	5–8
1845	..	7·9	4⅛	6	3⅛	5½–10
1846	..	11·2	4⅞	6¾	3½	7½–8½
1847	..	8·6	6⅛	7⅝	4½	—
1848	..	7·5	4⅛	5⅝	3¼	—
1849	..	12·3	5⅛	5⅞	3⅞	—
1850	..	12·1	7	7⅞	5¼	—
1851	..	9·5	5½	7⅛	4¼	—
1852	..	11·0	5 5/16	6¾	4¼	—
1853	..	11·0	5¾	6⅞	4⅛	—
1854	..	10·4	5⅜	6¾	3⅝	—
1855	..	10·3	5⅝	6¾	4	—
1856	..	13·5	6 5/16	7	4¾	—
1857	..	12·2	7¾	8⅞	5½	—
1858	..	12·1	6⅞	8⅛	5½	—
1859	..	11·0	6¾	8¼	5	—
1860	..	13·0	6¼	8 5/16	5	—
1861	..	31·3	8 9/16	9¾	6 5/16	—
1862	..	67·2	17¼	18⅛	12⅞	[Williams.]†
1863	..	101·5	23¼	24¼	19¼	20–30
1864	..	83·4	27½	28¾	21⅛	22½–31¼
1865	..	43·2	19	19½	14½	13–26¼
1866	..	31·6	15½	17⅛	12	16–24
1867	..	24·9	10⅞	11⅝	8¾	7¾–17
1868	..	29·0	10½	11⅛	8⅛	—
1869	..	24·0	12⅛	12¼	9½	—
1870	..	17·0	9 15/16	11⅝	8⅛	—

* "Statistics of the Cotton Trade," by Richard Burn. London, 1847, p. 22.

† "Seven Years' History of the Cotton Trade of Europe," by Maurice Williams. Liverpool, 1868.

TABLE F, I.—HISTORY OF COTTON PRICES—*Continued.*

Year.	American Price of Upland (cents per lb.).	Liverpool Prices (pence per lb.) *				Index Numbers (Year 1900 = 100).		
		Middling American.	Fair Pernam.	Fair Surat.	Egyptian.	Cotton.	All Textiles.	General.
1871 ..	20·60	$8\frac{[illegible]}{16}$	$9\frac{9}{16}$	$5\frac{13}{16}$	—	135·1	146·4	135·6
1872 ..	18·20	$10\frac{9}{16}$	$10\frac{3}{8}$	$7\frac{1}{2}$	—	162·6	166·5	145·2
1873 ..	17·00	9	$9\frac{3}{8}$	$6\frac{5}{16}$	—	153·7	161·9	151·9
1874 ..	15·00	8	$8\frac{1}{4}$	$5\frac{15}{16}$	—	139·0	151·1	146·9
1875 ..	13·00	$7\frac{3}{8}$	$7\frac{15}{16}$	5	—	133·1	147·3	146·4
1876 ..	11·70	$6\frac{1}{4}$	$6\frac{1}{2}$	$4\frac{1}{2}$	—	115·9	137·9	137·1
1877 ..	11·30	$6\frac{5}{16}$	$6\frac{1}{2}$	$5\frac{3}{16}$	—	111·2	135·2	140·4
1878 ..	10·80	$6\frac{1}{8}$	$6\frac{11}{16}$	$4\frac{15}{16}$	—	107·3	131·4	131·1
1879 ..	12·00	$6\frac{5}{16}$	$6\frac{13}{16}$	5	—	105·7	123·0	125·0
1880 ..	11·30	$6\frac{15}{16}$	$6\frac{9}{16}$	$5\frac{1}{4}$	—	112·7	130·0	129·0
1881 ..	12·20	$6\frac{7}{16}$	$6\frac{9}{16}$	$4\frac{3}{8}$	—	112·2	127·6	126·6
					G.F. Brown†			
1882 ..	10·60	$6\frac{5}{8}$	$7\frac{1}{16}$	$4\frac{5}{16}$	$8\frac{1}{2}$	112·3	123·4	127·7
1883 ..	10·60	$5\frac{3}{4}$	$5\frac{15}{16}$	$3\frac{7}{8}$	8	111·4	119·1	125·9
1884 ..	10·50	6	$6\frac{3}{16}$	$3\frac{15}{16}$	$7\frac{1}{8}$	109·1	115·2	114·1
1885 ..	9·40	$5\frac{5}{8}$	$5\frac{13}{16}$	$4\frac{1}{4}$	6	109·8	108·9	107·0
1886 ..	10·30	$5\frac{1}{8}$	$5\frac{5}{16}$	$3\frac{9}{16}$	$6\frac{7}{16}$	95·5	99·9	101·0
1887 ..	10·30	$5\frac{1}{2}$	$5\frac{9}{16}$	$3\frac{9}{16}$	7	96·2	102·7	98·8
1888 ..	10·70	$5\frac{9}{16}$	$5\frac{3}{4}$	$3\frac{7}{8}$	$6\frac{3}{4}$	99·1	101·2	101·8
1889 ..	11·50	$5\frac{15}{16}$	$6\frac{5}{16}$	$4\frac{3}{16}$	$7\frac{7}{16}$	101·1	105·1	103·4
1890 ..	8·60	6	$6\frac{5}{16}$	$4\frac{3}{16}$	$6\frac{15}{16}$	102·3	105·4	103·3
1891 ..	7·30	$4\frac{11}{16}$	$5\frac{5}{16}$	$3\frac{7}{16}$	$5\frac{7}{8}$	99·1	101·4	106·9
1892 ..	8·40	$4\frac{3}{16}$	$4\frac{1}{8}$	$3\frac{3}{16}$	$4\frac{13}{16}$	91·6	95·6	101·1
1893 ..	7·50	$4\frac{5}{8}$	$4\frac{3}{4}$	$3\frac{9}{16}$	$5\frac{1}{4}$	93·0	96·4	99·4
1894 ..	5·90	$3\frac{13}{16}$	4	$2\frac{5}{8}$	$4\frac{3}{4}$	79·1	88·6	93·5
1895 ..	[illegible]·20	$3\frac{27}{32}$	4	$2\frac{11}{16}$	$5\frac{13}{16}$	74·4	84·3	90·7
1896	7·30	$4\frac{11}{32}$	$4\frac{5}{8}$	$3\frac{3}{32}$	$6\frac{1}{16}$	88·7	92·9	88·2
				No. 1 Good Oomra.				
1897 ..	5·60	$3\frac{29}{32}$	$4\frac{1}{4}$	$3\frac{11}{32}$	$4\frac{15}{16}$	80·1	86·8	90·1
1898 ..	4·90	$3\frac{5}{16}$	$3\frac{11}{16}$	$2\frac{7}{8}$	$4\frac{7}{16}$	68·9	80·0	93·2
1899 ..	7·60	$3\frac{9}{16}$	$3\frac{15}{16}$	$3\frac{1}{32}$	$5\frac{7}{16}$	73·0	82·9	92·2

* From the Annual Circular of the Liverpool Cotton Association, except for certain gaps filled up from Turner Routledge's "Cotton Diagram." By comparing this table with Table F, II., it will be found that these two authorities do not always agree exactly as to average prices—*e.g.*, see 1913-14.

† From Turner Routledge's "Cotton Diagram."

TABLE F, I.—HISTORY OF COTTON PRICES—*Continued.*

Season.	American Price of Upland (cents per lb.).	Liverpool Prices (pence per lb.).				Index Numbers (For Calendar Year).		
		Middling American.	Fair Pernam.	No. 1 Fine Oomra.	F.G.F. Brown Egyptian.	Cotton.	All Textiles.	General.
1899–1900	7·60	4·87	5·06	4·40	6·81	100·0	100·0	100·0
1900–01 ..	*9·30	5·16	5·50	4·37	6·87	98·6	93·3	96·7
1901–02 ..	8·10	4·78	4·87	4·19	6·31	97·3	92·3	96·4
1902–03 ..	8·20	5·44	5·57	4·47	8·44	107·3	101·7	96·9
1903–04 ..	12·16	6·94	5·16	5·56	8·56	119·9	112·9	98·2
1904–05 ..	8·66	4·93	5·25	4·62	7·37	101·5	106·7	97·6
1905–06 ..	10·94	5·94	6·23	5·00	9·25	119·2	121·1	100·8
1906–07 ..	10·01	6·38	6·97	4·87	10·37	126·8	127·4	106·0
1907–08 ..	11·46	6·19	6·79	5·03	8·81	116·1	109·8	103·0
1908–09 ..	9·24	5·50	5·84	4·94	8·44	118·4	112·4	104·1
1909–10 ..	14·29	7·86	8·34	6·31	13·12	155·9	136·2	108·8
1910–11 ..	14·69	7·84	8·27	7·03	10·75	138·3	128·9	109·4
1911–12 ..	9·69	6·09	6·70	5·62	9·56	122·6	119·6	114·9
1912–13 ..	12·05	6·76	7·11	6·15	9·79	139·5	135·0	116·5
1913–14 ..	13·07	7·27	7·47	5·87	9·45	—	—	—

* Up to 1901 the American price is for the calendar year. From 1901–02 onwards the price is for the season to April 1. See "Supply and Distribution of Cotton," 1914, p. 27, and "Cotton Production," 1913, p. 21.

Season.	American (Middling). Highest.	American (Middling). Lowest.	American (Middling). Average.	American (Middling). Quinquennial Averages.	Indian (No. 1, Fine Oomra). Highest.	Indian. Lowest.	Indian. Average.	Indian. Per Cent. to American.	Indian. Quinquennial Averages.	Egyptian (Fully Good Fair Brown). Highest.	Egyptian. Lowest.	Egyptian. Average.	Egyptian. Per Cent. to American.	Egyptian. Quinquennial Averages.
1889–90	6·75	5·56	6·19		5·19	4·81	5·03	81		7·87	7·19	7·37	118	
1890–91	5·94	4·37	5·00		4·81	3·87	4·34	86		7·25	5·87	6·31	126	
1891–92	4·94	3·56	4·12	4·81	4·31	3·44	3·81	92	4·25 / 88	6·12	4·37	5·06	122	5·76 / 119
1892–93	5·37	3·94	4·61		4·81	3·69	4·28	92		5·62	4·31	5·12	110	
1893–94	4·69	3·81	4·19		4·31	3·25	3·81	91		5·50	4·62	4·94	117	
1894–95	4·19	3·00	3·44		3·56	2·75	3·06	89		6·87	4·19	5·31	155	
1895–96	4·94	3·81	4·38		4·37	3·41	3·87	88		6·31	5·87	6·06	138	
1896–97	4·78	4·81	4·22	3·76	4·15	3·59	3·81	90	3·43 / 91	6·12	4·87	5·31	126	5·22 / 139
1897–98	4·16	3·19	3·47		3·81	3·12	3·34	96		4·94	4·19	4·44	125	
1898–99	3·56	3·00	3·28		3·19	2·87	3·09	94		5·44	4·19	5·00	152	
1899–1900	6·06	3·47	4·87		5·12	3·15	4·40	90		8·44	5·37	6·81	140	
1900–01	7·37	4·28	5·16		5·12	3·69	4·37	84		8·25	5·44	6·87	133	
1901–02	5·37	4·25	4·78	5·44	4·40	3·90	4·19	88	4·60 / 85	7·75	5·37	6·25	131	7·39 / 136
1902–03	7·12	4·40	5·46		5·06	4·22	4·47	82		11·12	7·00	8·44	155	
1903–04	8·96	5·68	6·94		7·25	4·56	5·56	80		10·69	6·81	8·56	123	
1904–05	6·88	3·68	4·91		5·37	3·87	4·62	94		8·62	6·56	7·44	152	
1905–06	6·42	5·26	5·95		5·25	4·62	5·00	84		10·62	7·81	9·25	155	
1906–07	7·52	5·31	6·38	5·78	5·25	4·56	4·87	76	4·89 / 85	11·62	9·25	10·37	163	8·86 / 153
1907–08	7·57	5·16	6·17		5·25	4·69	5·03	82		10·75	7·19	8·81	143	
1908–09	6·92	4·80	5·50		5·75	4·50	4·94	90		9·56	7·37	8·44	153	
1909–10	8·50	6·77	7·86		6·62	5·69	6·31	80		16·19	9·56	13·12	167	
1910–11	8·42	6·57	7·84		7·62	6·00	7·03	90		12·94	9·62	10·75	135	
1911–12	7·53	4·92	6·09	7·16	6·44	5·00	5·62	92	6·20 / 87	10·50	8·87	9·56	157	10·54 / 147
1912–13	7·19	6·05	6·75		6·44	5·75	6·15	91		10·20	9·30	9·82	146	
1913–14	7·96	6·20	7·26		6·56	4·70	5·87	81		10·45	8·15	9·44	130	

* From Turner Routledge and Company's Annual "Cotton Diagram."

TABLE F, III.—WEEKLY SPOT PRICES IN LIVERPOOL OF VARIOUS KINDS OF COTTON FROM THE BEGINNING OF SEASON 1913–14.*

Date.	American Middling.	Indian No. 1 Good Oomra.	West African Middling.	East African G.F.	Pernam. Fair.	Peru Smooth. G.F.	Peru Rough G.F.	Egyptian F.G.F. Brown.	Jannovitch Fine.	Sea Island Fine.	Florida Fancy.
September 5, 1913	7·35	5·94	6·88	7·80	7·43	8·03	8·25	10·05	11·60	16·25	12·25
„ 12 ..	7·39	6·00	6·90	7·80	7·45	8·05	8·40	10·10	11·70	15·75	11·75
„ 19 ..	7·57	6·12	7·08	7·95	7·60	8·23	8·55	10·10	11·70	15·75	11·75
„ 26 ..	7·85	6·25	7·38	8·20	7·85	8·43	8·65	10·30	11·90	15·75	11·75
October 3 ..	7·87	6·31	7·38	8·20	7·93	8·53	8·65	10·40	12·00	15·75	11·75
„ 10 ..	7·52	6·19	7·03	7·85	7·60	8·18	8·90	10·00	11·60	15·75	11·75
„ 17 ..	7·64	6·19	7·21	8·05	7·78	8·36	8·90	10·25	11·90	15·75	11·75
„ 24 ..	7·74	6·31	7·38	8·20	7·88	8·53	9·00	10·30	11·90	15·75	11·75
„ 31 ..	7·63	6·31	7·50	8·10	7·81	8·37	9·00	10·25	11·85	15·75	12·00
November 7 ..	7·51	6·25	7·26	7·95	7·68	8·21	9·00	10·25	11·90	15·75	12·00
„ 14 ..	7·47	6·19	7·26	7·95	7·68	8·21	9·00	10·15	11·80	15·75	12·00
„ 21 ..	7·36	6·19	7·17	7·85	7·60	8·02	9·00	10·20	11·85	15·75	12·00
„ 28 ..	7·22	6·12	7·09	7·75	7·54	7·94	9·00	10·10	11·85	15·75	12·00
December 5 ..	7·33	6·19	7·13	7·85	7·68	7·93	9·00	10·20	11·85	15·75	12·00
„ 12 ..	7·26	6·06	7·06	7·80	7·55	7·91	8·75	10·05	11·80	15·75	12·00
„ 19 ..	7·11	6·00	6·89	7·65	7·38	7·74	8·75	9·95	11·60	15·75	12·00
„ 23 ..	6·91	5·87	6·69	7·45	7·18	7·54	8·75	9·85	11·40	15·50	11·75
January 2, 1914	—	—	—	—	No issue	—	—	—	—	—	—
„ 9 ..	6·91	5·87	6·69	7·45	7·20	7·54	8·75	9·75	11·30	14·50	11·75
„ 16 ..	7·16	5·75	6·90	7·65	7·39	7·75	8·75	9·80	11·35	13·50	11·75
„ 23 ..	7·21	5·75	6·95	7·70	7·43	7·80	8·75	9·85	11·40	13·00	11·75
„ 30 ..	7·09	5·75	6·81	7·55	7·28	7·66	8·75	9·55	11·15	13·00	11·75
February 6 ..	6·96	5·62	6·68	7·40	7·14	7·53	8·75	9·40	11·15	13·00	11·75
„ 13 ..	7·04	5·56	6·76	7·50	7·23	7·61	8·75	9·30	11·10	13·00	11·75
„ 20 ..	7·09	5·56	6·81	7·55	7·27	7·66	8·75	9·20	11·00	13·00	12·00
„ 27 ..	7·08	5·56	6·80	7·55	7·26	7·65	8·75	9·15	10·95	13·50	12·25

March	6	6·99	5·50	6·71	7·45	7·17	7·56	8·75	8·90	10·85	13·50	12·75
,,	13	7·02	5·50	6·76	7·50	7·22	7·61	8·75	8·80	10·95	13·50	12·75
,,	20	7·08	5·56	6·82	7·55	7·22	7·67	8·75	8·90	11·05	13·50	12·75
,,	27	7·11	5·56	6·85	7·60	7·24	7·70	8·75	8·85	11·00	13·50	12·75
April	3	7·26	5·56	7·00	7·75	7·34	7·85	8·75	9·10	11·20	13·50	12·75
,,	8	7·38	5·56	7·12	7·85	7·44	7·97	8·75	9·20	11·30	13·50	12·50
,,	17	7·30	5·56	7·04	7·75	7·36	7·89	8·75	9·10	11·25	13·50	12·50
,,	24	7·36	5·56	7·10	7·80	7·42	7·95	8·50	9·05	11·20	13·50	12·50
May	1	7·26	5·56	6·96	7·70	7·36	7·86	8·50	9·05	11·20	13·50	12·50
,,	8	7·32	5·50	7·06	7·80	7·49	7·96	8·50	9·10	11·20	13·50	12·50
,,	15	7·47	5·44	7·19	7·95	7·64	8·09	8·50	9·25	11·30	13·50	12·50
,,	22	7·59	5·31	7·31	8·05	7·71	8·21	8·60	9·25	11·30	13·50	12·50
,,	28	7·75	5·31	7·47	8·20	7·87	8·37	8·60	9·35	11·40	13·50	12·50
June	3	7·73	5·31	7·45	8·20	7·83	8·35	8·60	9·40	11·45	13·50	12·50
,,	12	7·87	5·31	7·61	8·35	7·95	8·51	8·60	9·35	11·40	13·50	12·50
,,	19	7·68	5·31	7·50	8·25	7·84	8·40	8·60	9·15	11·30	13·50	12·50
,,	26	7·58	5·19	7·50	8·25	7·77	8·40	8·60	9·10	11·30	13·50	12·50
July	3	7·46	5·19	7·22	8·15	7·66	8·27	8·60	9·00	11·20	13·50	12·50
,,	10	7·33	5·12	7·05	8·10	7·59	8·20	8·60	9·10	11·30	13·50	12·50
,,	17	7·35	5·12	7·13	8·20	7·63	8·28	8·60	9·10	11·25	13·50	12·50
,,	24	7·38	5·12	7·16	8·25	7·66	8·31	8·60	9·10	11·25	13·50	12·50
,,	30	6·86	4·94	6·66	7·75	7·28	7·81	8·50	8·70	10·80	13·50	12·50
August	7	6·50	4·75	6·32	7·40	6·95	7·52	8·50	8·30	10·40	13·50	12·50
,,	14	6·50	4·55	6·32	7·40	6·95	7·52	8·50	8·30	10·40	13·50	12·50
,,	21	6·20	4·40	5·90	7·00	6·73	7·20	8·50	8·15	10·25	12·50	11·50
,,	28	6·20	4·40	5·90	7·00	6·73	7·20	8·50	8·15	10·25	12·50	11·50
September	4	6·20	4·40	5·90	7·00	6·73	7·20	8·50	8·15	10·25	12·50	11·50
,,	11	6·00	4·20	5·70	6·80	6·53	7·00	8·50	8·00	10·10	12·50	11·50
,,	18	5·80	4·20	5·50	6·60	6·33	6·80	8·50	8·00	10·10	12·50	11·50
,,	25	5·55	4·15	5·25	6·35	6·08	6·55	8·50	7·85	9·95	12·50	11·25

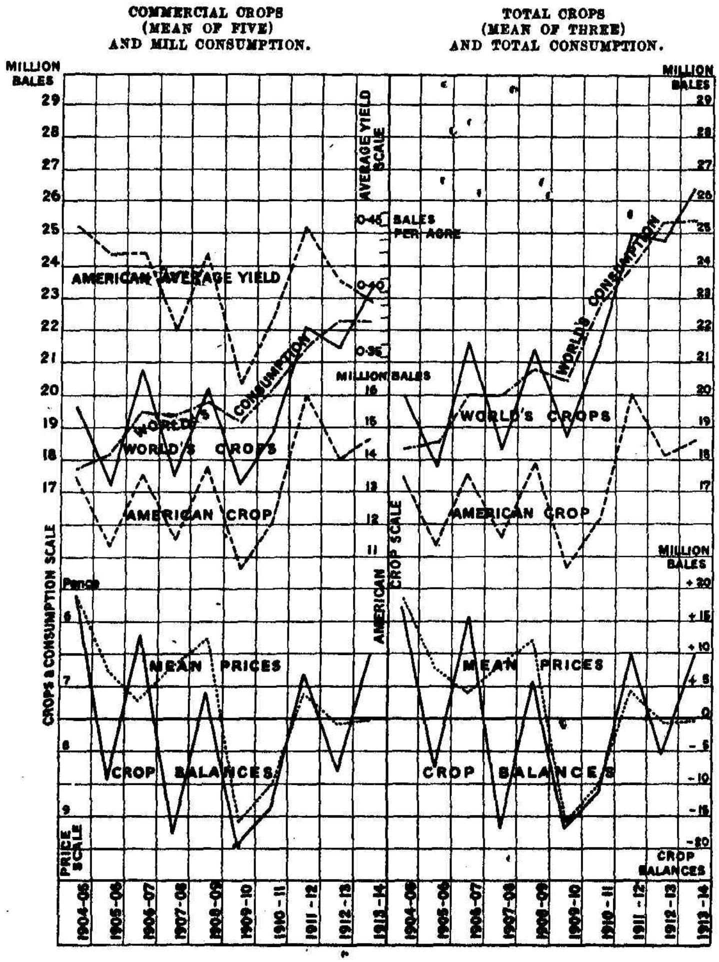
* From the Weekly Circular of the Liverpool Cotton Association.

TABLE F, III.—WEEKLY SPOT PRICES IN LIVERPOOL OF VARIOUS KINDS OF COTTON FROM THE BEGINNING OF SEASON 1913-14.—*Continued.*

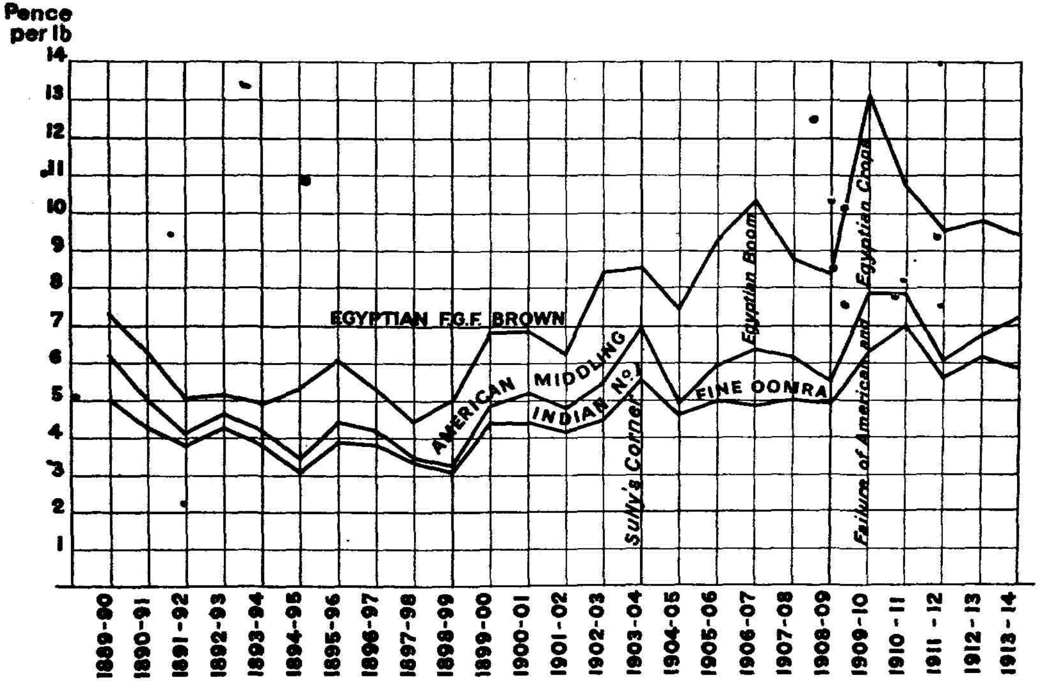
Date.	American Middling.	Indian No. 1 Good Oomra.	West African Middling.	East African G.F.	Pernam. Fair.	Peru Smooth G.F.	Peru Rough G.F.	Egyptian F.G.F. Brown.	Jannovitch Fine.	Sea Island Fine.	Florida Fancy.
October 2, 1914	5·30	4·15	5·00	6·10	5·90	6·30	8·50	7·60	9·95	12·50	11·25
„ 9 ..	5·30	4·15	5·00	6·10	5·85	6·20	8·50	7·50	9·85	12·50	11·25
„ 16 ..	5·05	4·15	4·75	5·85	5·50	5·85	8·50	7·20	9·65	12·50	11·25
„ 23 ..	5·05	4·15	4·65	5·85	5·50	5·85	8·50	7·20	9·65	12·50	11·25
„ 30 ..	4·80	4·05	4·40	5·60	5·25	5·60	8·50	7·00	9·65	12·50	11·00
November 6 ..	4·64	3·95	4·24	5·45	5·19	5·44	8·50	7·00	9·50	12·50	10·75
„ 13 ..	4·58	3·88	4·17	5·40	5·02	5·37	8·50	7·15	9·65	12·50	10·75
„ 20 ..	4·44	3·76	4·04	5·25	4·84	5·24	8·50	7·05	9·75	12·50	10·75
„ 27 ..	4·46	3·76	4·08	5·30	4·88	5·28	8·50	7·05	9·75	13·00	11·00
December 4 ..	4·35	3·76	3·99	5·20	4·79	5·09	8·50	6·75	9·60	13·00	11·00
„ 11 ..	4·28	3·76	3·96	5·15	4·71	5·06	8·50	6·45	9·50	13·00	11·00
„ 18 ..	4·44	3·70	4·10	5·30	4·85	5·20	8·50	6·30	9·50	13·00	11·00
„ 23 ..	4·58	3·76	4·24	5·45	4·99	5·34	8·50	6·30	9·50	13.00	11·00
„ 30 ..	4·62	3·76	4·26	5·45	5·01	5·36	8·50	6·30	9·50	13·00	11·00
January 8, 1915	4·71	3·88	4·39	5·60	5·14	5·49	8·50	6·30	9·50	13·00	11·00
„ 15 ..	4·80	3·94	4·52	5·75	5·27	5·62	8·50	6·30	9·50	13·00	11·00
„ 22 ..	5·10	4·36	4·82	6·05	5·57	5·82	8·50	6·50	9·50	13·00	11·00
„ 29 ..	5·02	4·18	4·76	6·00	5·51	5·76	8·50	6·50	9·50	13·00	11·00
February 5 ..	5·09	4·18	4·87	6·10	5·58	5·82	8·50	6·65	9·50	13·00	11·00
„ 12 ..	4·97	4·00	4·75	6·00	5·45	5·70	8·50	6·75	9·60	13·00	11·50
„ 19 ..	5·01	4·00	4·79	6·05	5·49	5·59	8·65	6·75	9·60	13·50	12·50
„ 26 ..	4·97	4·00	4·77	6·05	5·47	5·57	8·65	6·80	9·60	13·50	12·50

DIAGRAMS

TO ILLUSTRATE THE PRECEDING PAGES

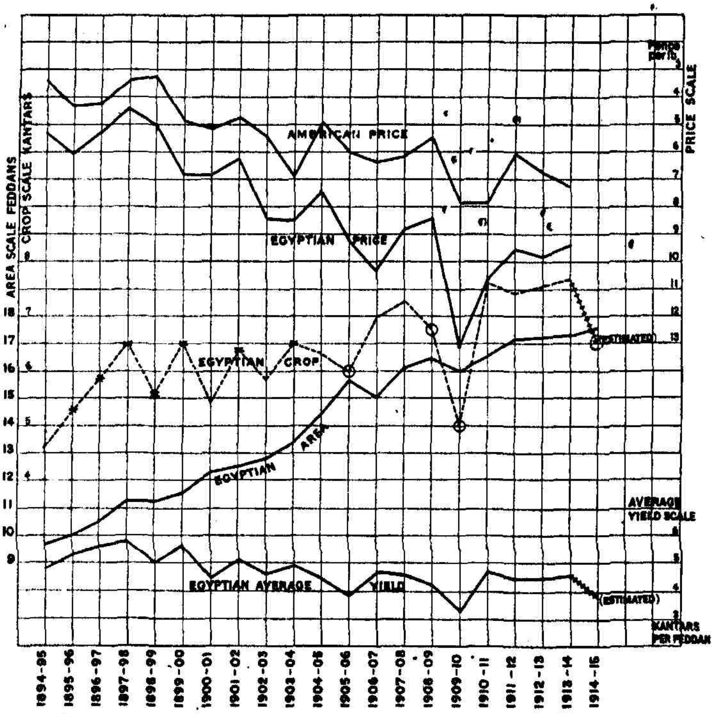


Balance of Production and Consumption.
(For Figures, see Table B, II., in the Appendix.)



SEASON'S AVERAGE PRICES OF INDIAN, AMERICAN, AND EGYPTIAN COTTON, 1889–1914.

(Founded on Turner Routledge and Co.'s "Cotton Diagram. For Figures see Table F, 11., in the Appendix.)

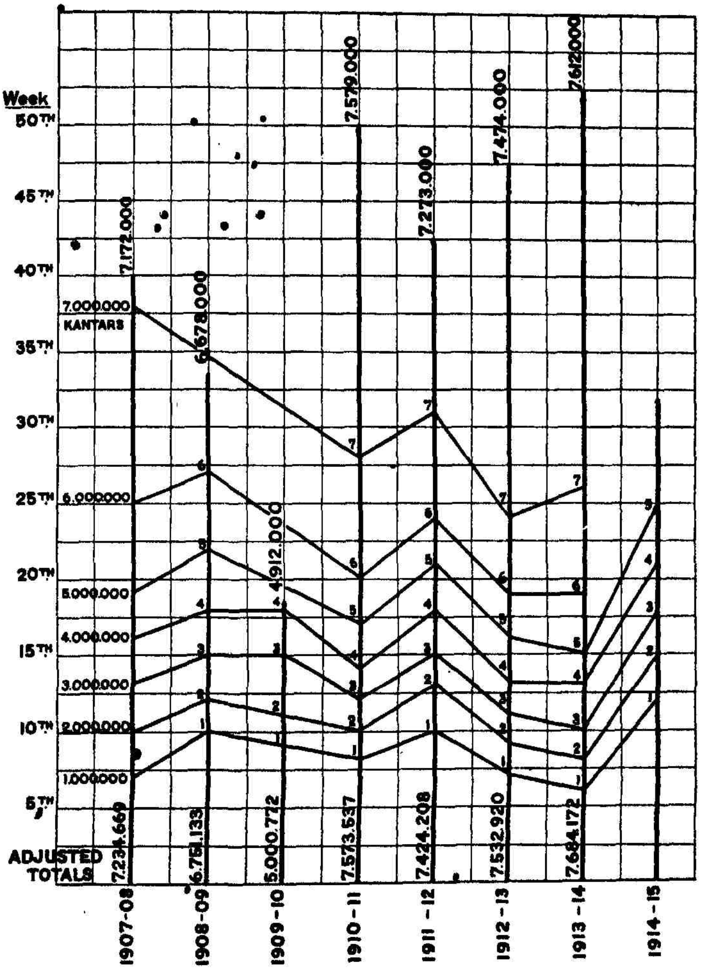


EGYPTIAN AREA, CROP, AVERAGE YIELD, AND PRICE, WITH AMERICAN PRICE, 1894–1915.

(For Figures, see Table on p. 294.)

x = Good crop—*i.e.*, average yield above 4·87 kantars per feddan.
o = Bad crop—*i.e.*, average yield below 4·17 kantars per feddan.

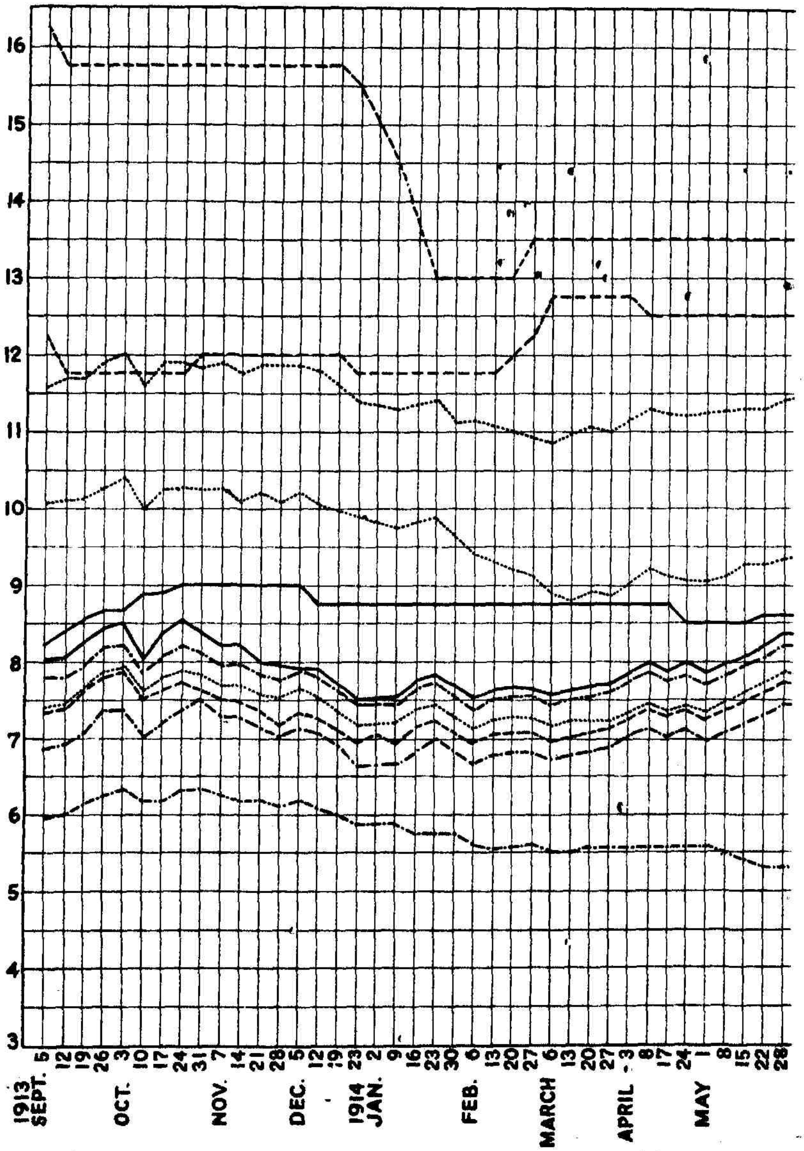
This diagram is intended to bring out the absence of anything but occasional correlation between the amount of the Egyptian crop and its price, the latter being mainly controlled by the American price. It also shows very strongly the rapid increase of area and the fall of the average yield.



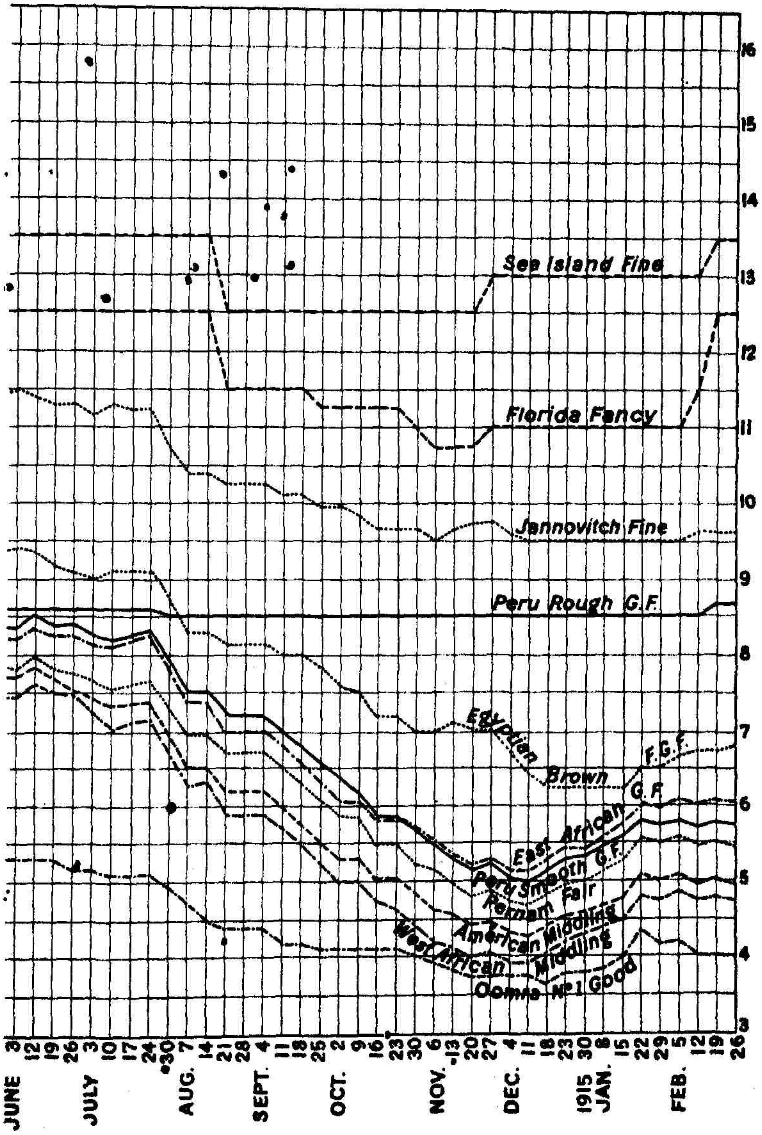
EGYPTIAN COTTON CROP.

Arrivals of cotton at Alexandria, showing the week in which each complete million kantars was reached in each season.

(For Figures, see Table E, II., in the Appendix.)



LIVERPOOL WEEKLY SPOT PRICES OF
(For Figures, see Table



AMERICAN AND ELEVEN OTHER VARIETIES, 1913–1915.

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